ENGAGING THE NEXT GENERATION OF THE CANADIAN STEM WORKFORCE THROUGH SPACE SCIENCE. B. Shankar[1] and C. Du[1], [1]Indus Space Inc. (3395 Cliff Road North, Mississauga ON, Canada L5A 3M7, bshankar@indusspace.ca).

Introduction: Nearly every aspect of our daily lives is touched and made better by space innovation and beyond the academic community, the public sector does not often recognize the direct link between the space sector and the benefit to society.

Canada is major player on the global scale in space exploration – the technologies and expertise make Canada a leader in research and development specific to Earth observation using satellites, robotics, and planetary exploration. Canada's space sector contributes $2.3 billion to Canada's gross domestic product, directly employs almost 10,000 Canadians and is one of the most research and development intensive sectors in the Canadian economy. There are 200 listed space organizations across Canada contributing to 10,000 direct jobs that are STEM based. With Canada's recent commitment to the NASA led Lunar Gateway program [1], over the next two decades space companies and the sector will actively spend time innovating and pushing the boundaries of technological advances, resulting in a boom of job opportunities – there will be a need for highly skilled and qualified persons. This need will not be fulfilled by the current space community alone but will be equally needed for several generations to come. These highly skilled persons will be mainly engineers, scientists, all coming with a strong background in Science, Technology, Engineering, or Mathematics (STEM) skills and education. The Canadian Space Agency has also identified the need to inspire the next generation of Canadians to *reach for the stars* as part of their space strategy focus [2].

Value of a STEM learning: STEM learning is being recognized across the planet as a priority. As the impact of technology continues to grow, the ability for society to participate meaningfully in all aspects of life will depend more heavily on the foundations of STEM learning, the ability to understand scientific methods, digital literacy, and problem-solving. 72% of Canadian students think science is fun and recognize that STEM is important [3]. Students want to use their acquired STEM skills to solve problems and make a useful contribution to society. However, the % of students who chose a STEM program are far lower than expected. Only 20-40% of students chose a degree in a STEM field [4]. The enrollment number varies depending on the STEM field a student pursues, those numbers grossly vary between male and female students. For example, only 22% of Engineering students are women. Compared to the ~70% of students who recognize the value of STEM, having only ~20-40% graduate equates to a severe gap in highly qualified persons being able to meet the hiring demands.

Community Outreach and Engagement: Indus Space Inc. is a social enterprise organization structured to provide space themed educational content to youth, educators, and the general public. We currently work several space professionals in the community and non-profit organizations to introduce audiences to the world of space science, the relevance of the space sector to STEM themes, and provide opportunities for youth to meet local space professionals through our programs.

Space themed STEM programming: With a vast and expansive topic such as space science, we prescribe several programming styles and methodologies to directly engage our audiences. One type of programming includes an annual space themed STEM camps over the summer where we introduce the topics of Astronomy, Geology, Geography, and Engineering. We work with several educators in the public and private sector within the Greater Toronto Area and introduce the concepts of mission exploration, space, planetary science, and open source GIS datasets to middle-school and high school classrooms (Figure 1).

Community partnerships reaching diverse audiences: The Greater Toronto Area, where Indus Space operates from, is a rich culturally diverse region with thousands of families representing nearly all countries of the world. Over several years, we have developed and facilitated programing to several local organizations that have mandates to engage youth in STEM programming. These include herVolution, the Canadian Association for Girls in Science (CAGIS), the Royal Canadian Institute for Science (RCIS), and the Royal Astronomical Society of Canada. Each of these organizations value the role space science brings in terms of youth and public engagement and anecdotally recognize the lack of space science knowledge in the public sphere. STEM curriculum identified within several provinces education mandate similarly identify the value in introducing STEM topics as early as Gr. 3 and concepts as space exploration and remote sensing in high-school grades.

Need for access to space programming to low-income and Diverse communities, representation: Our research through programming and user surveys

indicate a high lack of awareness that Space Science or Planetary Science is a successful career path in the STEM world, and that Canada is a main participant on the global platform of space exploration. A further disconnect exists in young girls or women entering the post-secondary world, they do not identify with the idea that space science career is a viable option for them due to the lack of direct recognition or representation. Similarly, residents of the diverse ethnic communities within the Canadian landscape also do not see that on a global scale, their home countries may be active participants in the space community (for example, many do not know the value of the International Space Station and the overall goal or purpose of its mission).

Our purpose and mission through our programming aims to fill these gaps as best and as often as we can through diverse programming (including multi-lingual content). Since 2019 we have started an annual "Introduction to Space" workshop where we invite local space professionals to interact with middle-school and high school youth and educators and learn more about the ways space science research and innovation is being conducted in our local backyard. This program has been met with high success, with youth enjoying opportunities to see space content directly. Space professionals also enjoy the opportunities to connect with youth – in sharing their value of STEM and space. The recent national initiatives by the Canadian Space Agency, *The Junior Astronauts Challenge*, is an excellent way to bring that awareness. However more work is needed to have these and other initiatives reach broader communities through more collaborative approaches with regional and national organizations representing the academic, industry, and non-government sectors.

References: [1] Canadian Space Agency. (2019) The Lunar Gateway, https://bit.ly/2T5hk9Z [2] Canadian Space Agency (2019) Exploration, Imagination, Innovation – A new space strategy for Canada, 19p. https://bit.ly/2FvAL3I [3] Let's Talk Science report (2014) Spotlight on Science Learning: Shaping tomorrow's workforce. 28p. https://bit.ly/36vUlJe [4] Council of Canadian Academies (2015) STEM Skills and Canada's Economic Productivity, The Expert Panel on STEM Skills for the future. 216 p. https://bit.ly/2T8nFlf

Figure 1: Snapshots of public engagement events organized by Indus Space in the Greater Toronto and Niagara areas where youth and adults alike explore several aspects of Space Science in fun engaging and interactive ways. Photo Credit: Indus Space