Physics vs Engineering: How do Students Choose?

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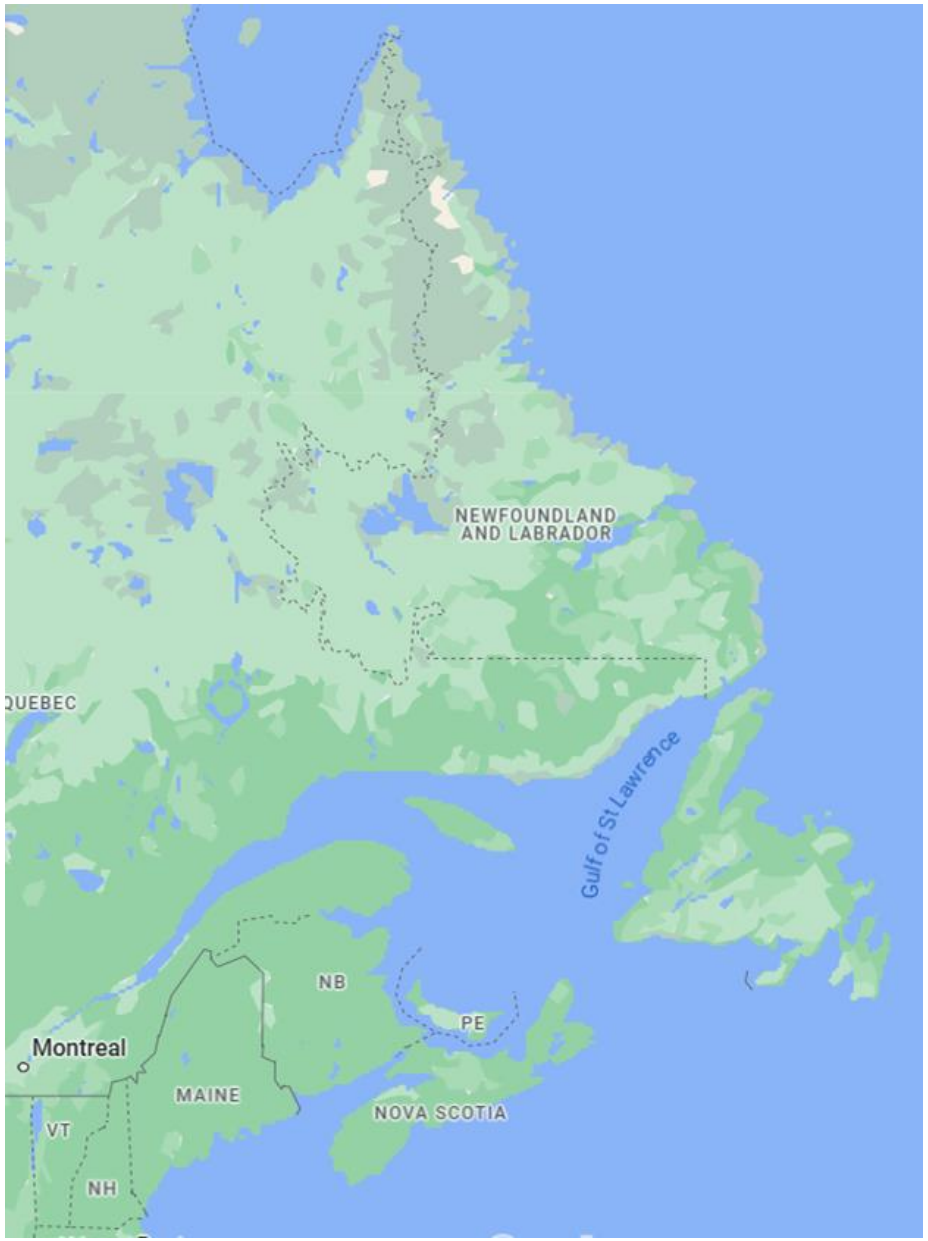
Dr. Cecilia Moloney, *Dept. Electrical and Computer Engineering, MUN*
Dr. Janna Rosales, *Faculty of Engineering and Applied Science, MUN*
Mr. Amit Sundly, *Faculty of Medicine, MUN*

We acknowledge that the lands on which Memorial University's campuses are situated are in the traditional territories of diverse Indigenous groups, and we acknowledge with respect the diverse histories and cultures of the Beothuk, Mi'kmaq, Innu, and Inuit of this province.



Cecilia Moloney

Professor
Electrical & Computer Engineering
Memorial University

Inviting you to solve problems, ask questions, attend to data and self.

Svetlana Barkanova

Professor
School of Science and the Environment, Grenfell Campus
Memorial University

I strive to encourage equity-deserving youth to consider careers in STEM.

Janna Rosales

Associate Professor (Teaching)
Faculty of Engineering and Applied Science
Memorial University

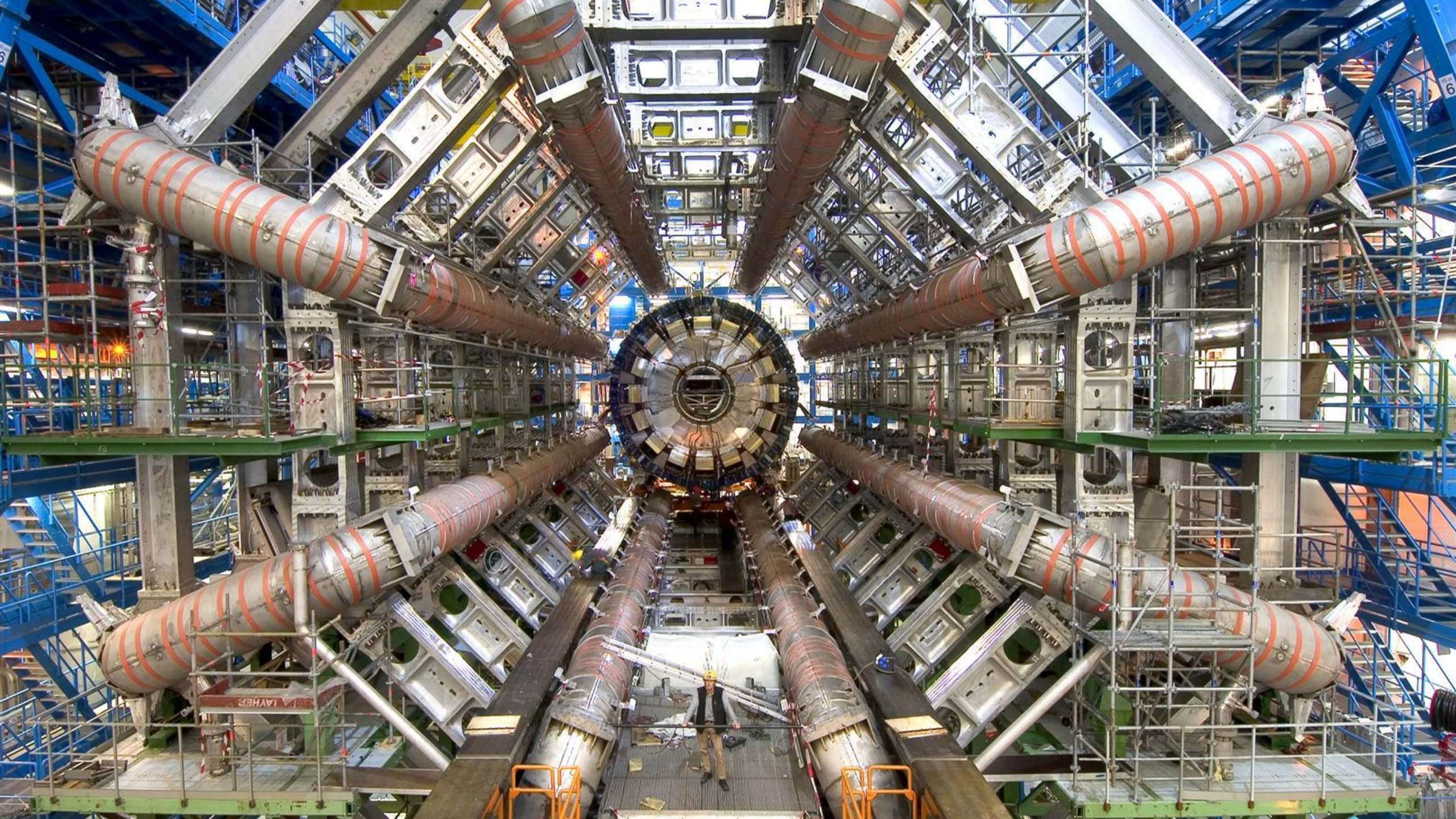
I explore how critical reflection builds better engineers.

Amit Sundly

Ph.D Candidate, Faculty of Medicine
Memorial University

I apply mixed-methods to study academic decision-making within STEM fields.

We're an interdisciplinary team of scientists, engineers, and educators with backgrounds in STEM outreach, equity, diversity & inclusion, student engagement, social justice and critical self-reflection.



Inspiration:

HS students who excel in mathematics, chemistry and physics often consider Engineering and Physical Sciences at the university level.

But how do they decide?

How can we advise them to choose the career best for them?

Motivation:

Inform outreach and pedagogy for science and engineering

Foster greater attraction and retention of undergraduate students in STEM fields

Improve career sustainability and life satisfaction for our graduates

The Survey Design:

The survey was directed at first-year undergraduate university students and conducted in September 2022 at a mid-sized Canadian comprehensive university:

- First-year engineering or physical sciences (physics, chemistry, earth sciences, etc.)
- 233 respondents; 169 met inclusion criteria
- 72% Engineering; 28% in Physical Sciences
- 23 statements about family influence, educational influence, social and cultural influences, personal interest and motivation (agree/disagree/neutral)
- Six questions about perceptions of engineering compared to physical sciences
- Nine demographic questions

Subject-Matter Overlap:

There are large subject-matter overlaps between disciplines on either side of the science-engineering divide, for example:

- between physics and electrical engineering,
- between computer science and computer engineering,
- between chemistry and chemical engineering.

Do high-school students understand the differences and similarities between physical sciences and engineering as they prepare to make career choices?

How does their understanding factor (if it does) into their choice of study in university?

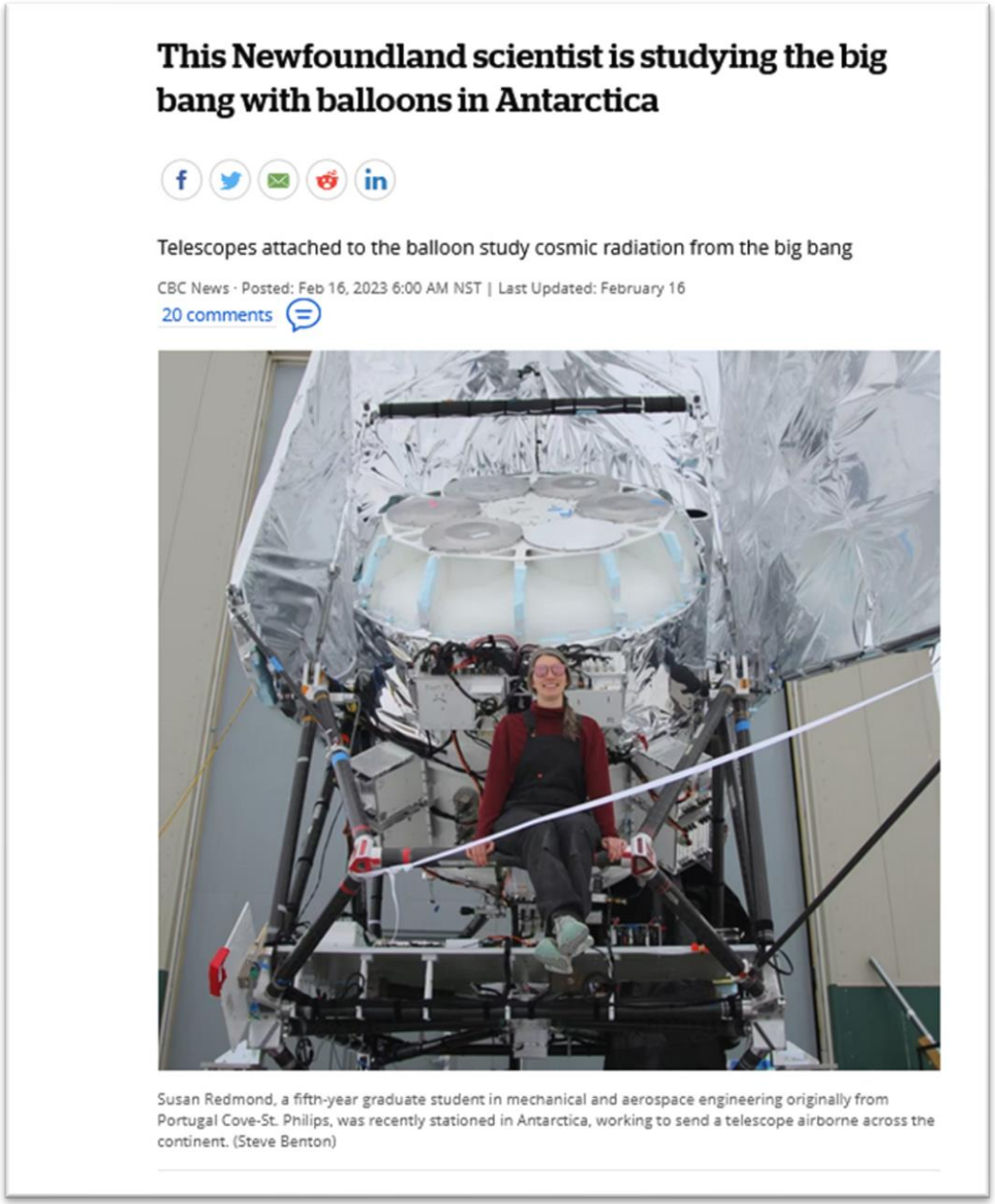
Subject-Matter Overlap:

The students who enter either engineering or the physical sciences likely took similar types of courses in high school.

At MUN, there is substantial overlap between first year engineering program and first year physical sciences.

We didn't expect our respondents' perception of the differences to be pronounced at this point in their lives.

CBC News: MUN engineering graduate is billed as a scientist: This Newfoundland scientist is studying the big bang with balloons in Antarctica | CBC News



This Newfoundland scientist is studying the big bang with balloons in Antarctica

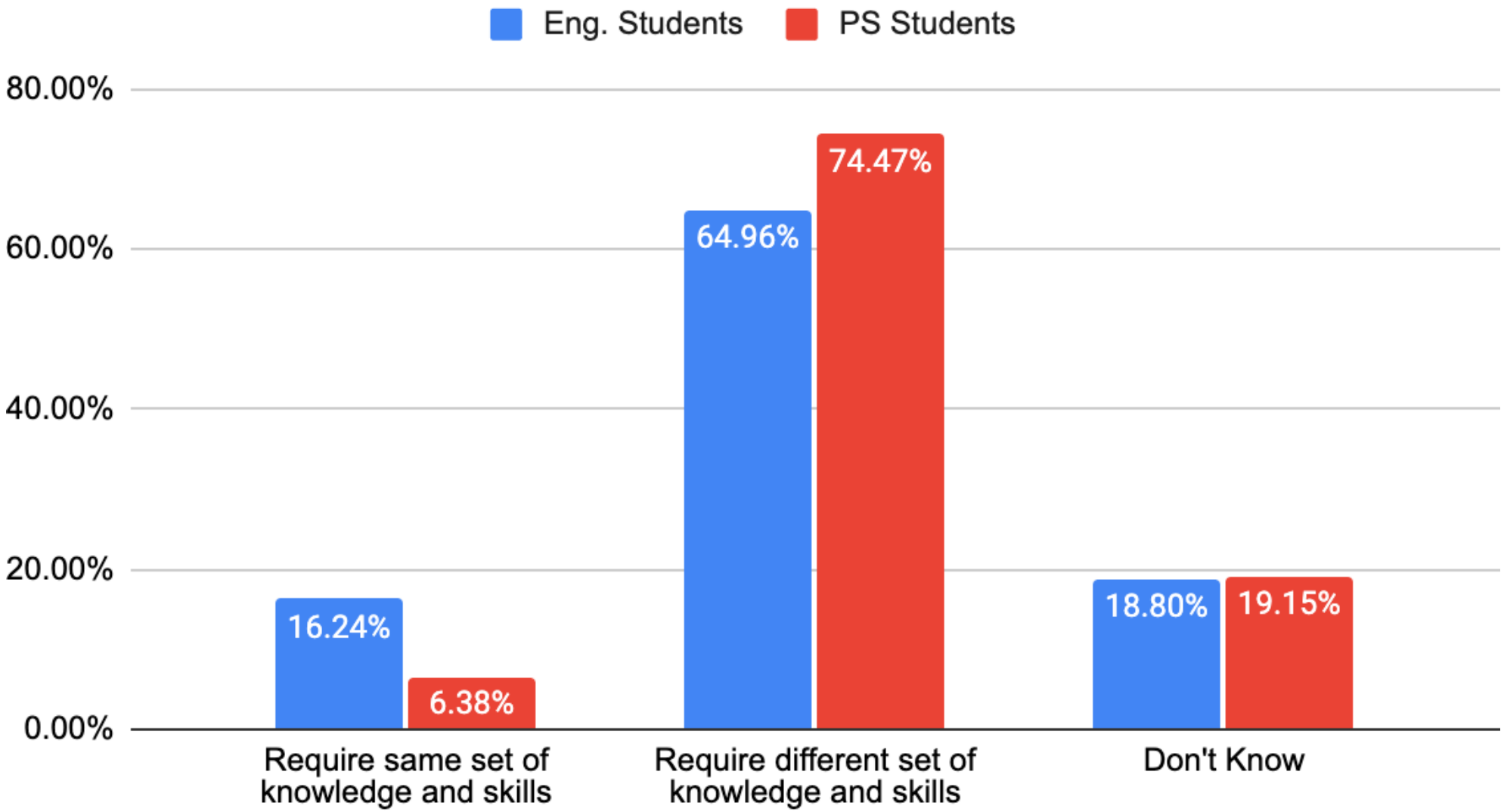
Telescopes attached to the balloon study cosmic radiation from the big bang

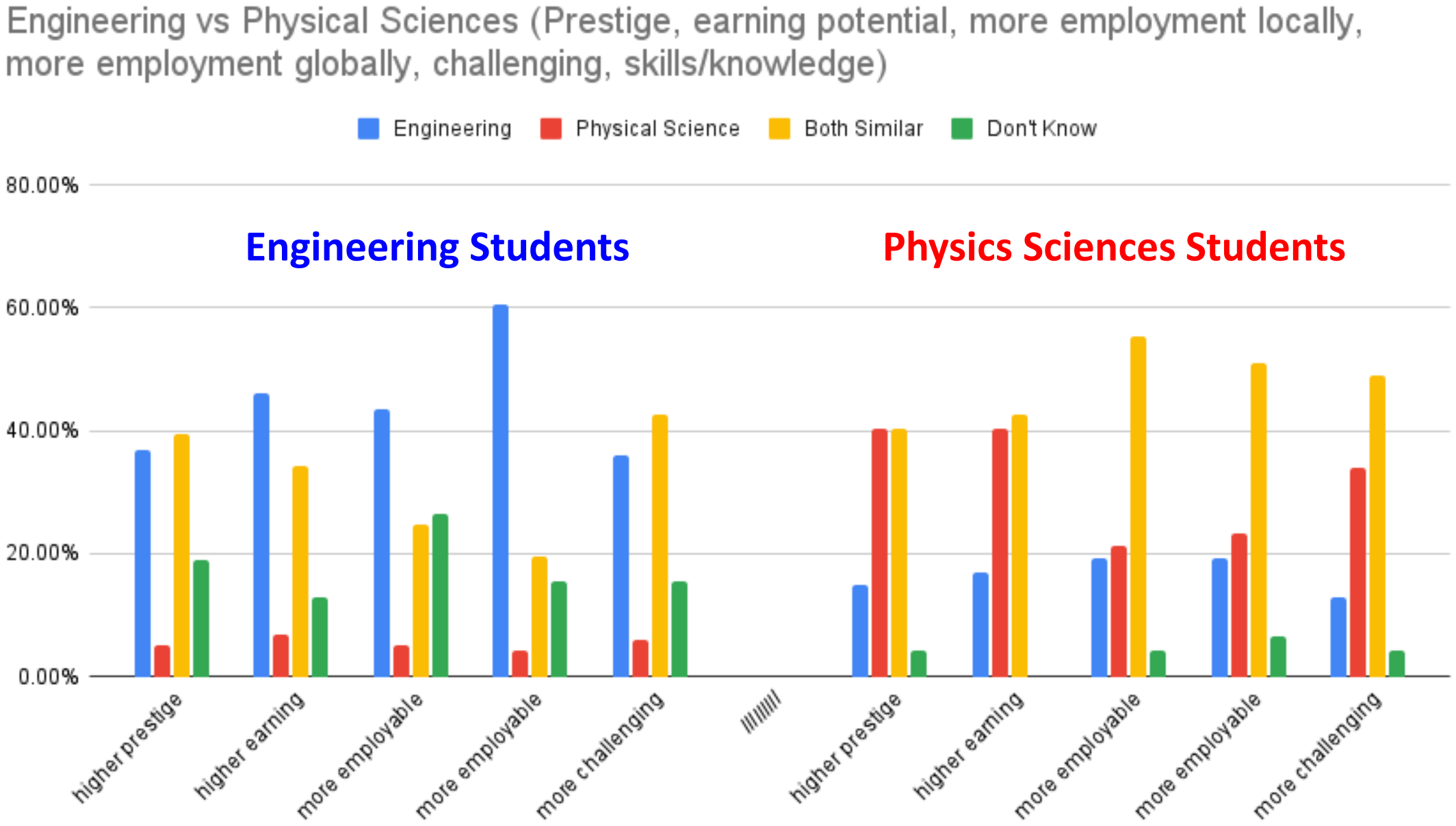
CBC News · Posted: Feb 16, 2023 6:00 AM NST | Last Updated: February 16

20 comments

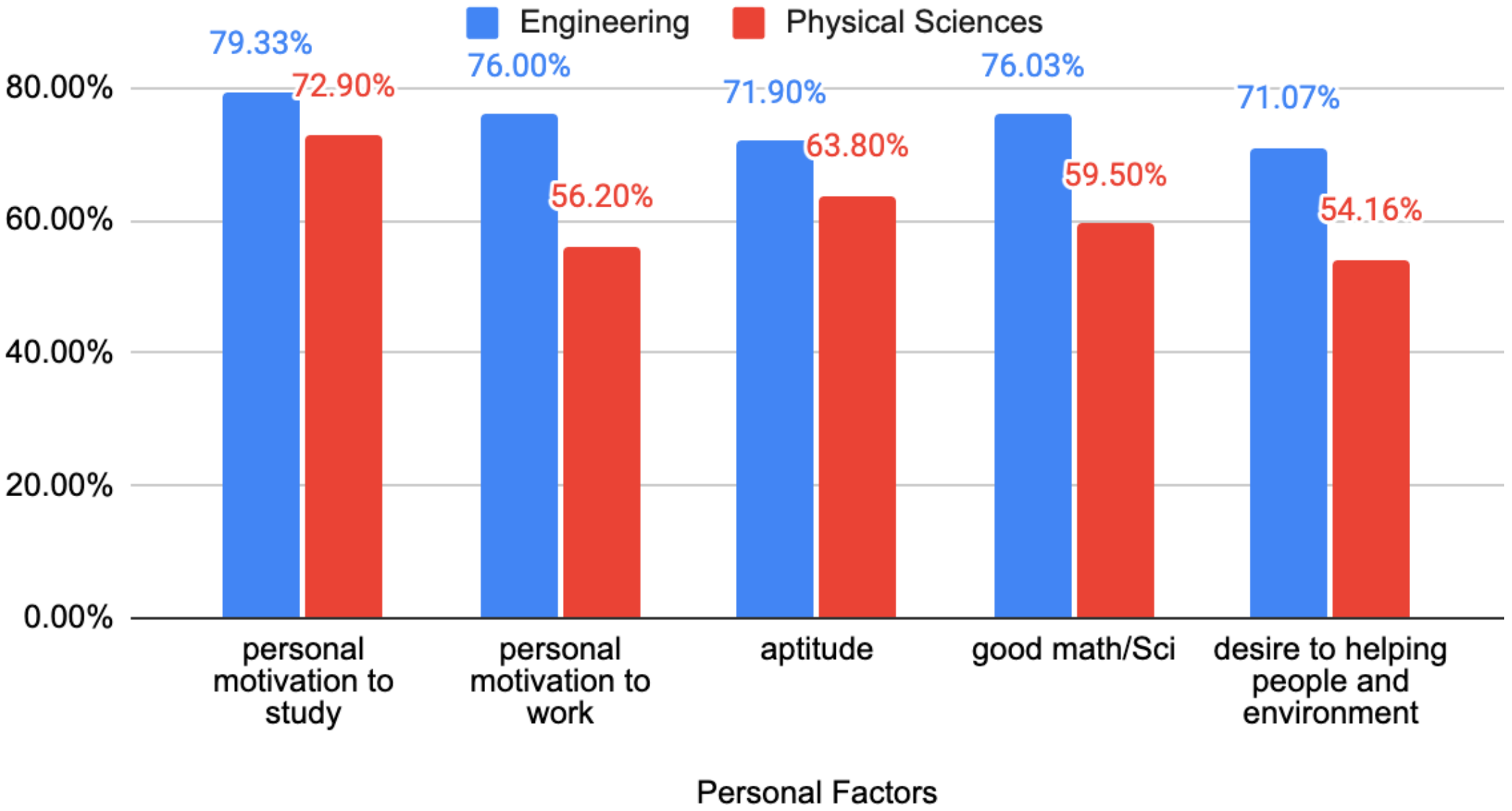
Susan Redmond, a fifth-year graduate student in mechanical and aerospace engineering originally from Portugal Cove-St. Philips, was recently stationed in Antarctica, working to send a telescope airborne across the continent. (Steve Benton)

Required Skills: Comparison




Engineering vs Physical Sciences (Prestige, earning potential, more employment locally, more employment globally, challenging, skills/knowledge)
Engineering
Physical Science
Both Similar
Don't Know
80.00%
60.00%
40.00%
20.00%
0.00%
Engineering Students
Physics Sciences Students
higher prestige
higher earning
more employable
more employable
more challenging
////////
higher prestige
higher earning
more employable
more employable
more challenging

Personal Factors: Comparison

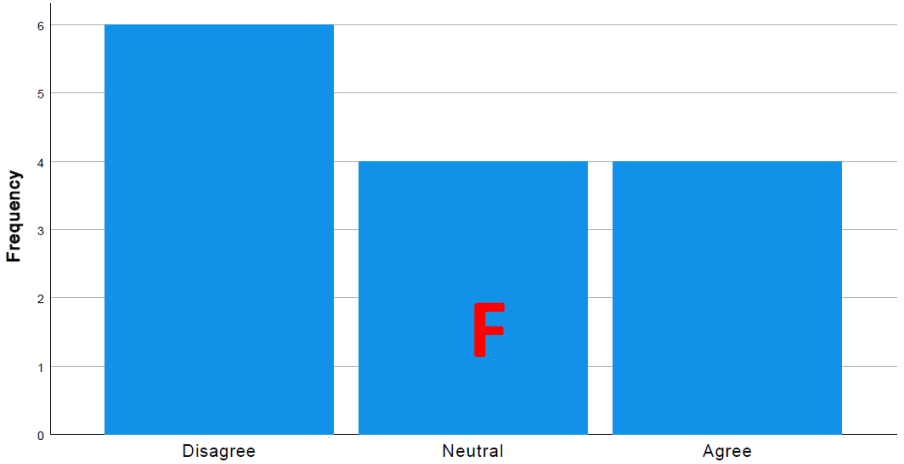


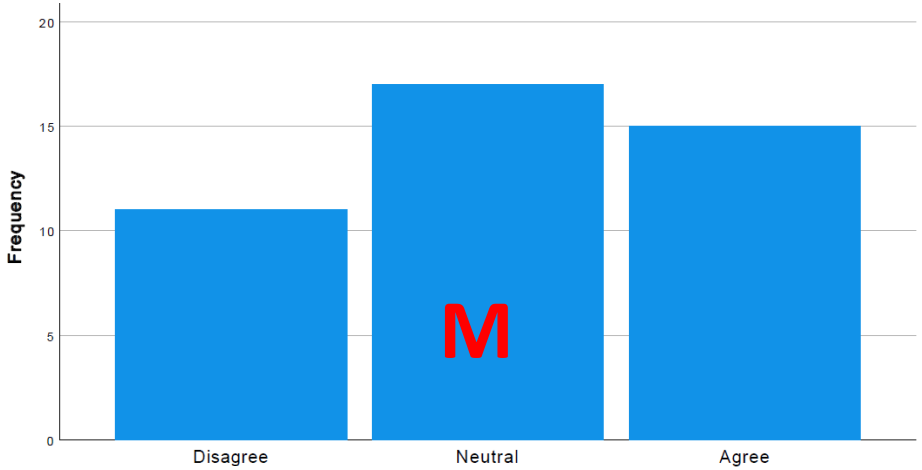
Societal/cultural factors that may have influenced their interest or decision:

	Engineering (% agree with statement)	Physical Sciences (% agree with statement)
Potential for well-paying job	74.4%	62.5%
Teacher influence	41.3%	52.1%
Guidance counsellor influence	24.8%	29.0%
Influence of STEM extra-curriculars and events	40.5%	41.7%

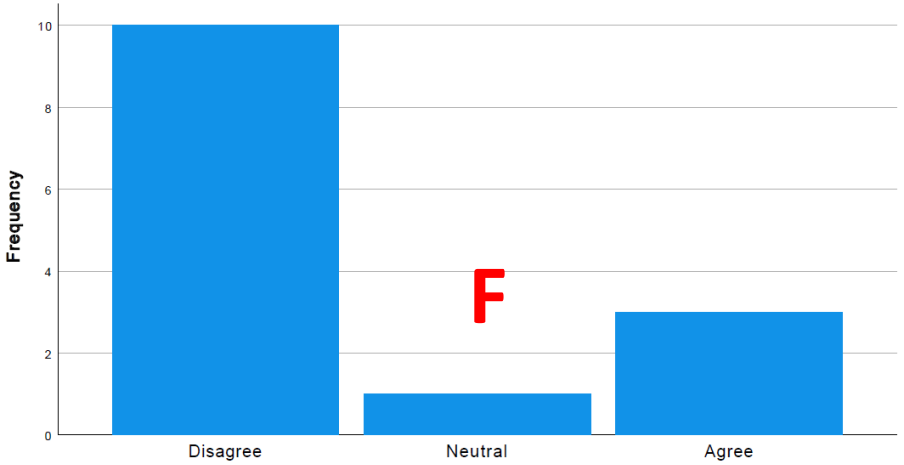
Parental influence for in (Phy+PhyOcean) + (Elec+Mech) cohort:

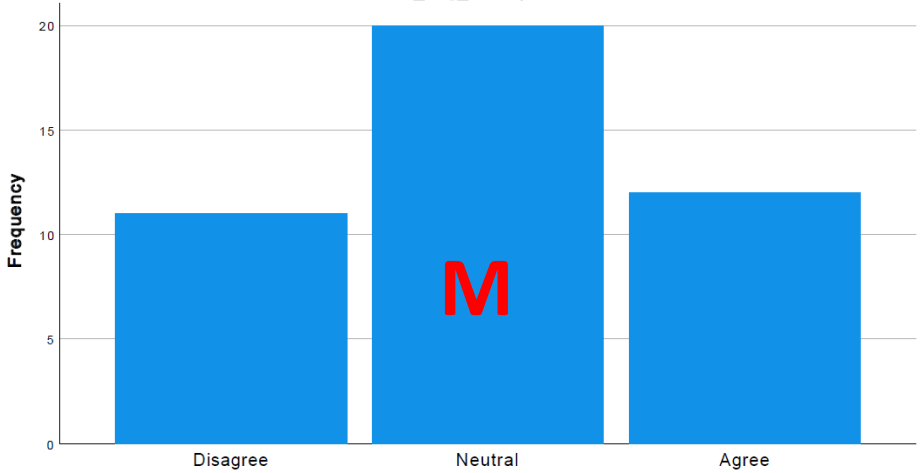
Q1: My parents suggested that I pursue a degree in PS/Engineering.





Q2: My parents expected me to pursue a degree in PS/Engineering.



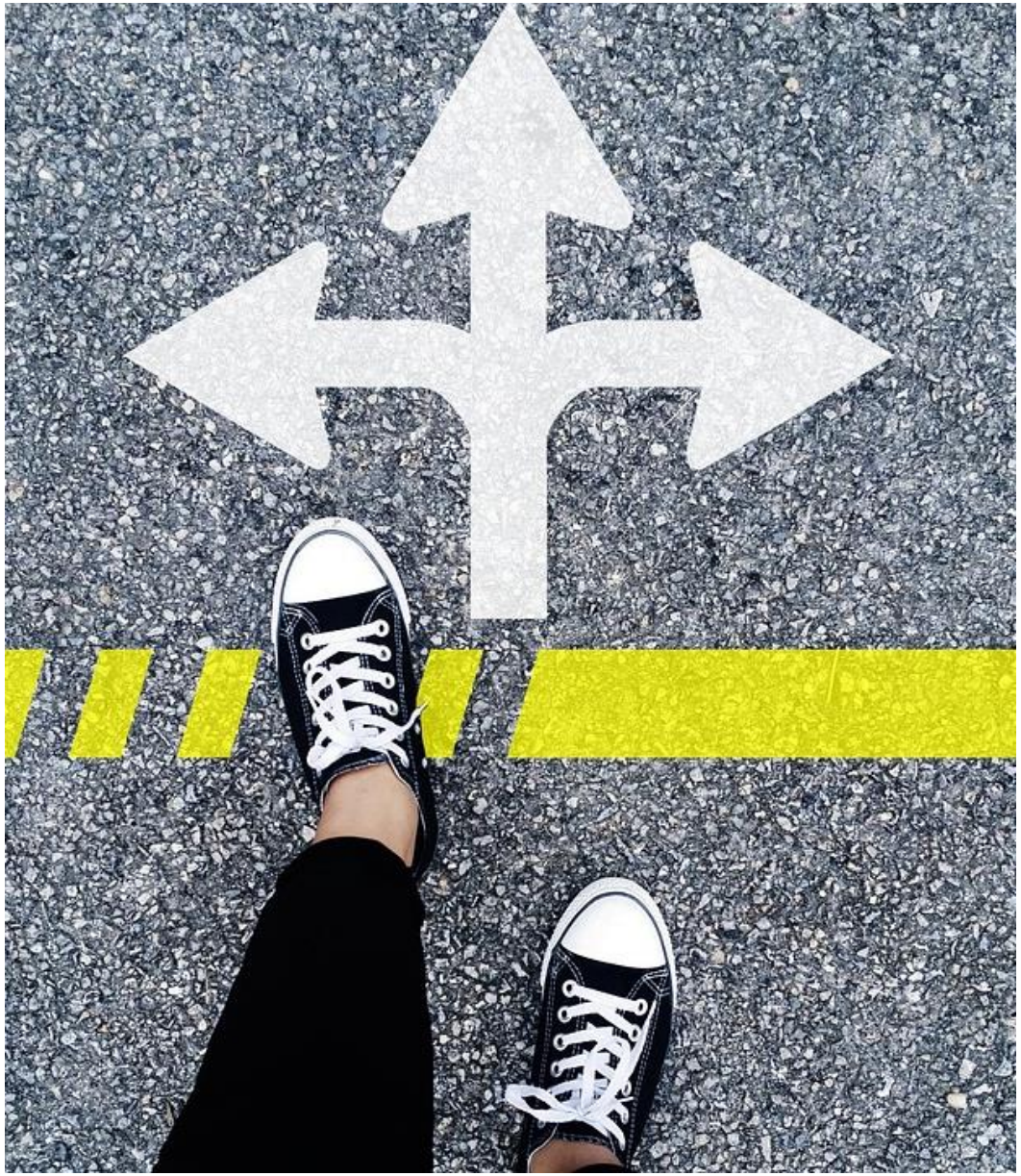


Potential Future Work:

Emerging adulthood is characterized by exploratory behavior, high rates of depression and anxiety, combined with a drive to succeed.

How overwhelmed did our respondents feel in making their choices? Excited or stressed?

A further study would ask about how students felt about their decision.



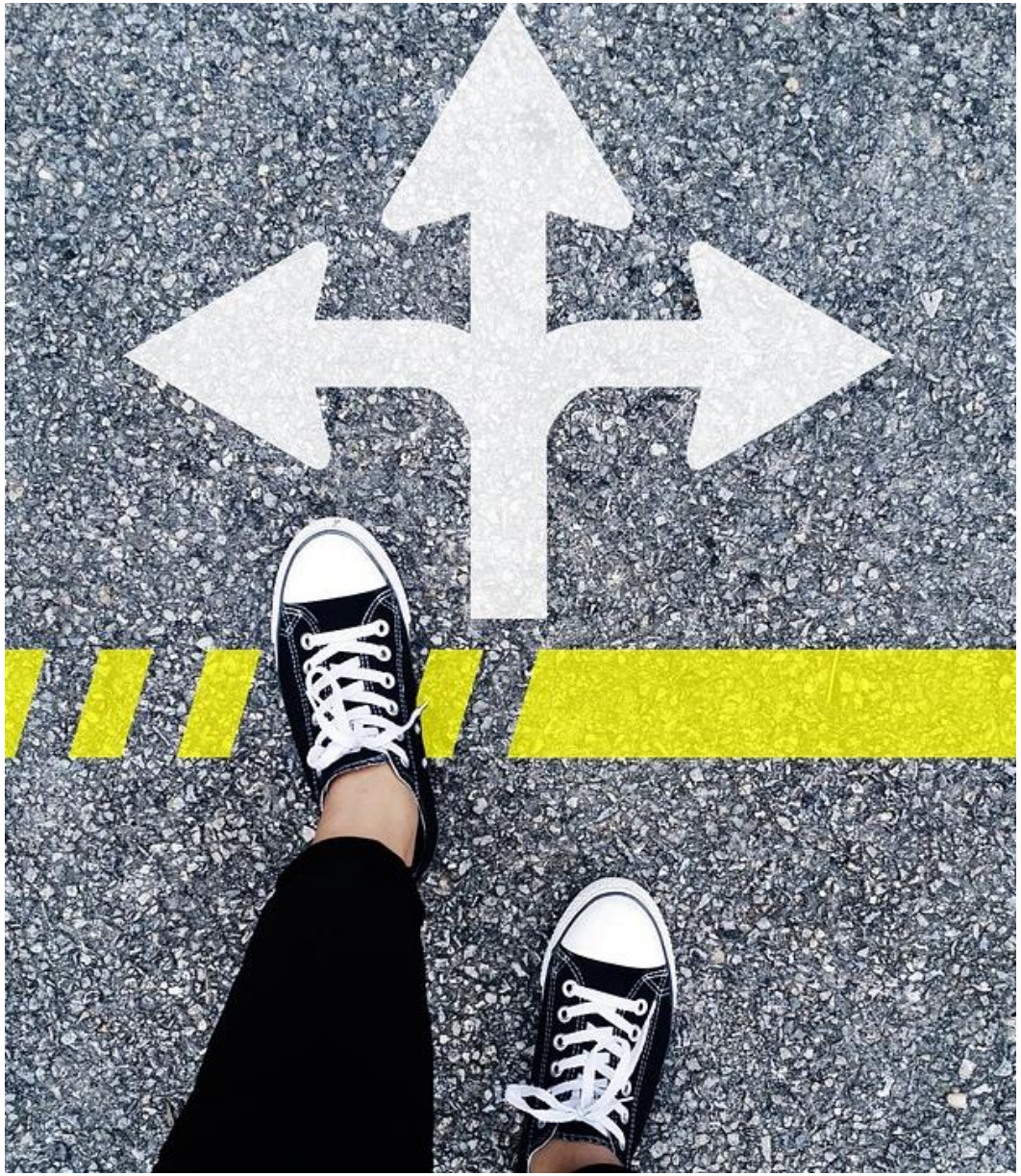
Potential Future Work:

The survey was directed at first-year students at MUN, a mid-sized comprehensive university and the only university in the province.

Would the results be different in other regions of Canada? Internationally?

Would graduating high-school students respond differently?

We are looking for collaborators to expand the study.



Please join us!

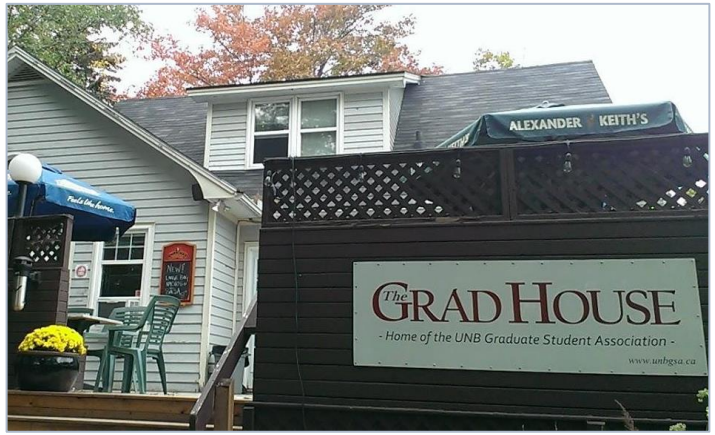
DGEP/DEP Reception

W3-7, Wednesday

3:45pm – 5:00pm

UNB Grad House

(Windsor Castle Bar)



2023 CAP Congress - June 18-23 | 2023 CAP Congress / Congrès de

https://indico.cern.ch/event/1191895/timetable/#20230621

14:00
- / Neutrino 3 | DM / Neutrino 3 (PPD) (W2-1) — Savino Longo — UNB Kinesiology, Rm. 214 (max. 60) — 13:45 - 15:15
- 2 DAMPOC I | DPAMPC I (DPAMPC) (W2-2) — Jens Lassen — UNB Tilley Hall, Rm. 5 (max. 70) — 13:45 - 15:15
- Medical Physics | Physique médicale (DPMB) (W2-3) — Dr Mamadou Diop — UNB Kinesiol... — 13:45 - 15:15
- Nicole Vassh,... — UNB Kinesiol... — 13:45 - 15:15
- W2-5 Engaging Diverse Audiences | Attirer des publics diversifiés (DEP/DEGP) (W2-5) — Ania Harlick — 13:45 - 15:15
- Steffon Luoma — UNB Tilley Ha... — 13:45 - 15:15
- Condensed matter theory II | Théorie de la matière condensée II (DPMCM) (W2-7) — Rachel Wortis

15:00
- Health Break with Exhibitors | Pause santé avec exposants — Richard J Currie Center Long Hall & Tilley Hall 102 Atrium — 15:15 - 15:45

16:00
- (PPD) W3-1 DM / Neutrino 4 | DM / Neutrino 4 (PPD) (W3-1) — Xiaoyue Li — UNB Kinesiol... — 15:45 - 17:00
- (DAMOPC) W3-2 Laser development | Développem... du laser (DPAMPC) (W3-2) — Jens Lassen
- (DCMMP) W3-3 Light and Matter | Lumière et matière (DPMCM) (W3-3) — Saurabh Maiti
- (DNP) W3-4 Nuclei and Neutrinos I | Nucléus et neutrinos I (DNP) (W3-4) — John Behr
- (DTP/PPD) W... — Nassim Bozor... — UNB Kinesio... — 15:45 - 17:0...
- (DAPI/DPMB)... — Steffon Luoma
- (DGEP/DPE) ... — Daria Ahrens...

17:00
- Travel time — University of New Brunswick — 17:00 - 17:15
- W-NSERC NSERC Community Update — Sjoerd Roorda — Richard J. Currie Center, University of New Brunswick — 17:15 - 18:00
- Division Judges Mee... / Rencontre des juges... compétition affiche (— Martin Williams — UNB Kinesiology, Rm...

18:00
- CAP-level BSOC and BSPC Judges Meeting | Réunion des juges (niveau ACP) pour MCOE et MCAE (W-BSOC-BSPC) — Martin Williams
- W-PLEN3 Plenary Session | Session plénière - Paul Garrett, Vogt Medal Winner (W-PLEN3)

(DGEP/DPE) W3-7 Networking Reception | Réception de réseautage (DGEP/DEP) (W3-7)

Block
3:45 PM - 5:00 PM
UNB Grad House (Windsor Castle Bar)

Session
(DGEP/DPE) W3-7 Networking Reception | Réception de réseautage (DGEP/DEP)

Contributions 0

Thank You! Questions?

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