

BIOMEDICAL ENGINEERING

2020

CLASS PROFILE

August 2020

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Introduction

The University of Waterloo's Biomedical Engineering (BME) program was inaugurated in 2014. The program is housed under the department of Systems Design Engineering (SYDE). As such, BME mirrors the interdisciplinary curriculum of SYDE, covering fundamentals in mechanical, electrical, and software engineering, all with a biomedical focus.

Over the last 5 years, the 53 students in our class spent 8 academic terms together and completed 6 co-op terms. This profile seeks to take a trip down memory lane, while uncovering both expected and unexpected truths about our collective experiences over the past 5 years. All data presented in this profile was gathered via survey, with a **response rate of 89% (47/53)**. Because all questions were optional, a N value is provided to reflect the number of respondents for a specific question.

Quick notes:

- All currencies are provided in CAD
- Salaries included housing stipends and bonuses acquired during the timeframe
- Comparison of gender to other variables was done excluding data given from those identifying outside of the gender binary. This was due to the small sample size making statistical relations biased, and to avoid publishing identifying information

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Class of 2020



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01

Demographics

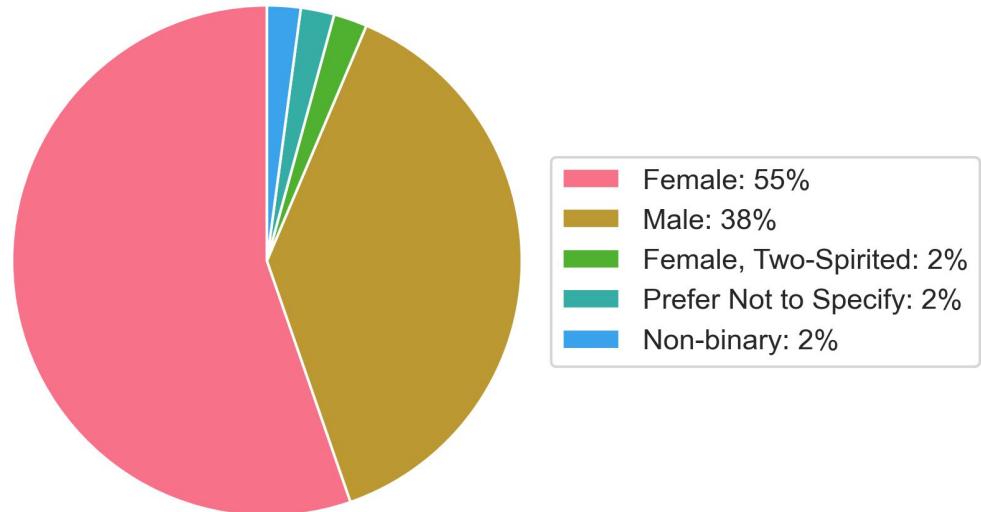
Background, Families, Ideology, High School

Gender

The class defied typical engineering gender ratios.

55% of the class was female, surpassing both the female-to-male ratio in the [BME 2019 class](#) and the [2016 Canadian Census statistic of women holding 34% of STEM bachelor's degrees](#).

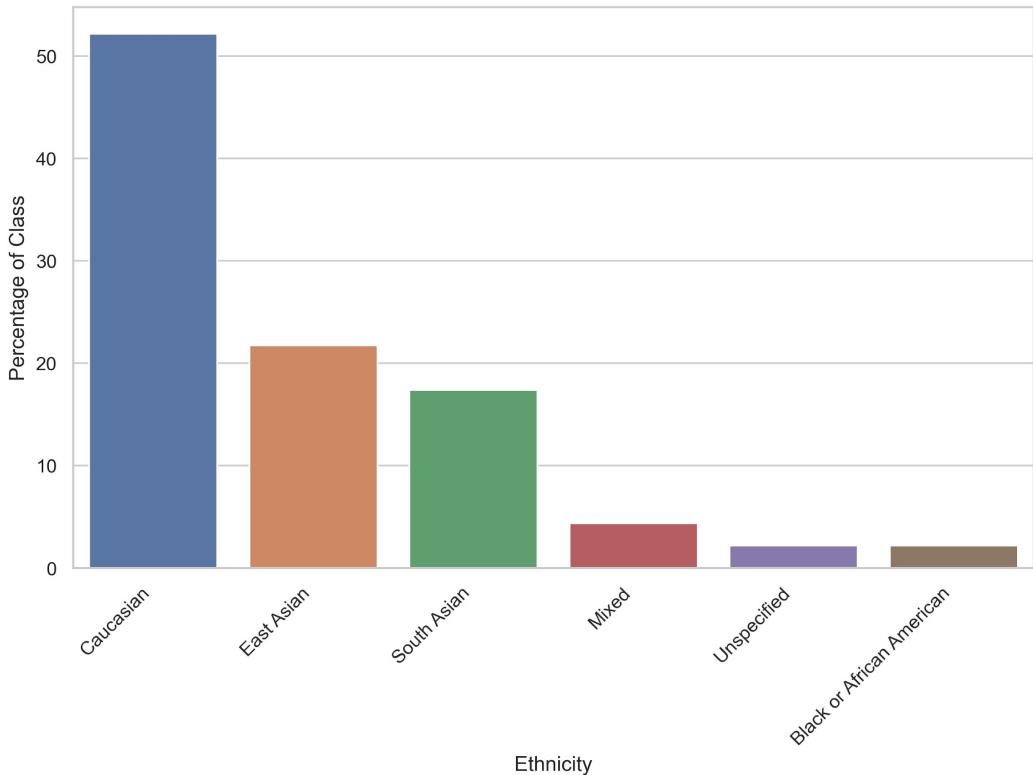
6% identified as other or preferred not to specify.



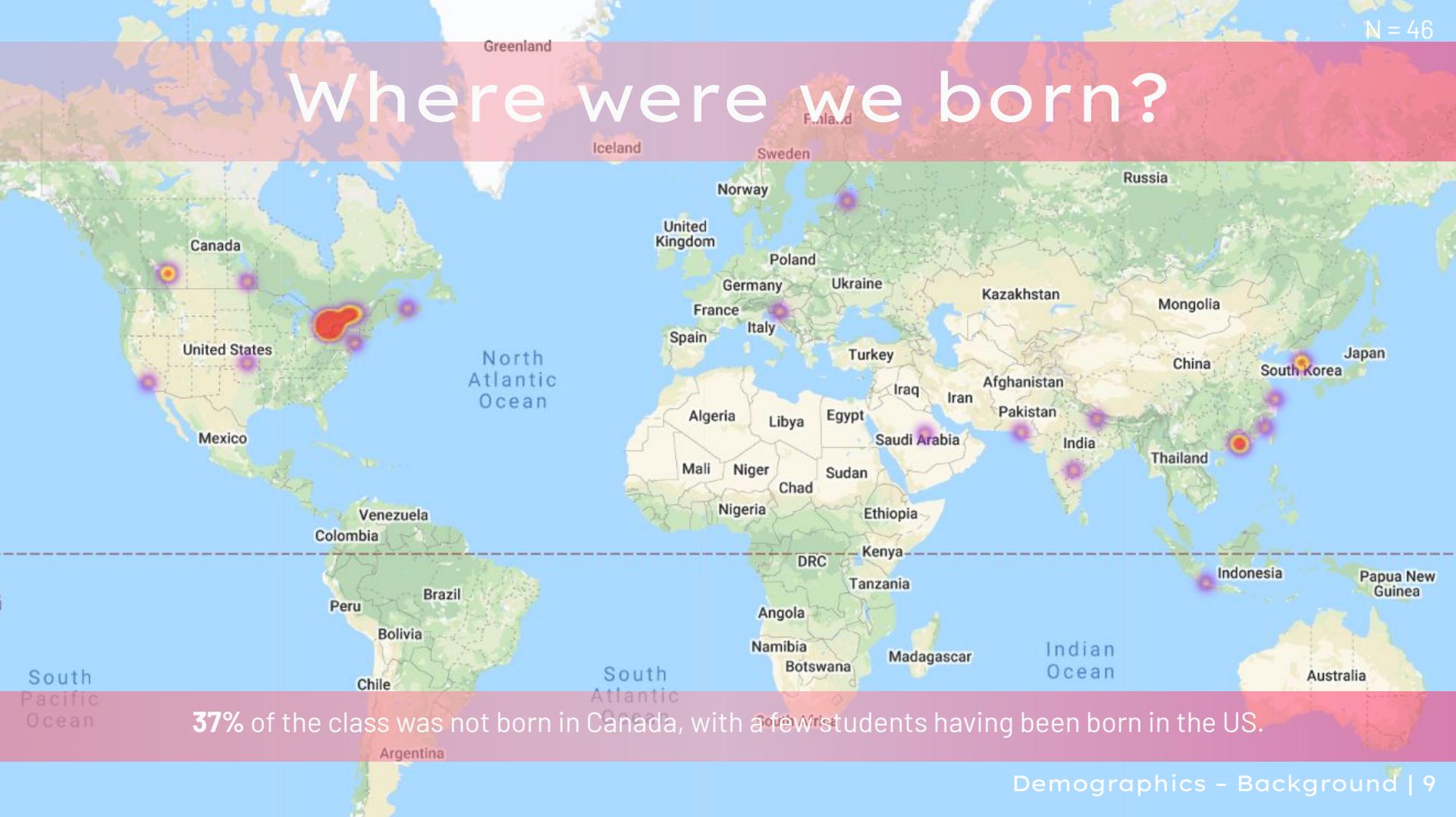
Ethnicity

Caucasian students made up just over **half** of the class.

The other major ethnic groups included East Asian students at **22%**, and South Asian students at **15%**.



Where were we born?

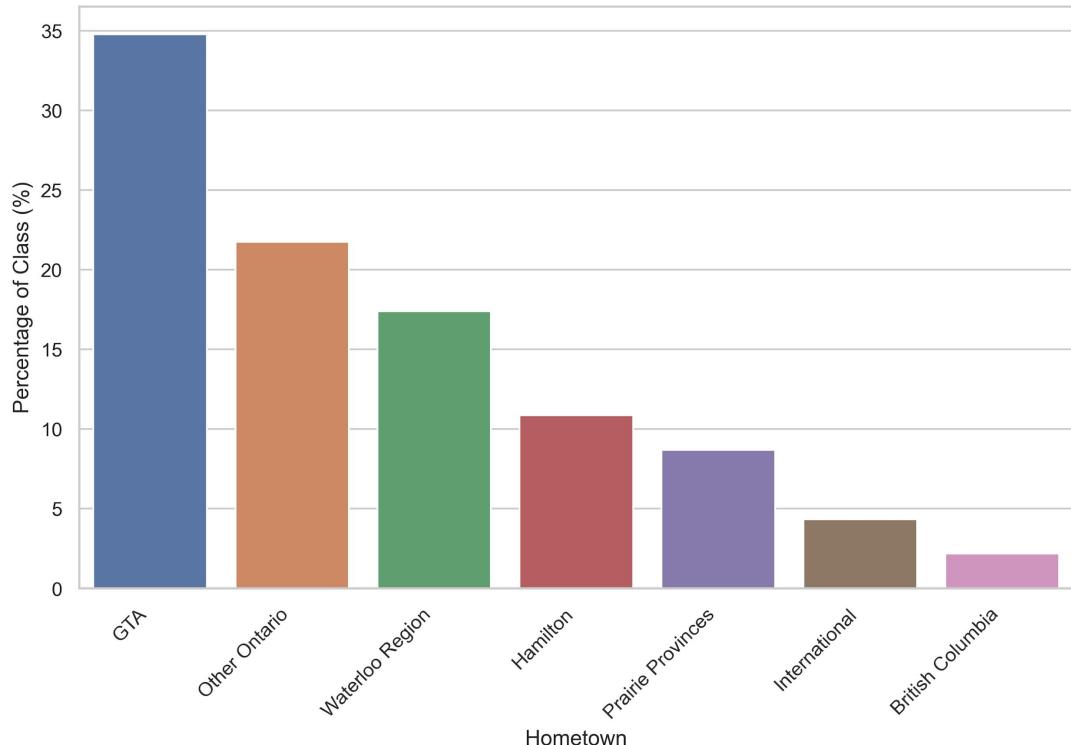


Where were we living right before university?

Although **37%** of the class was born outside of Canada, only **4%** were international students.

85% of the class went to high school in Ontario.

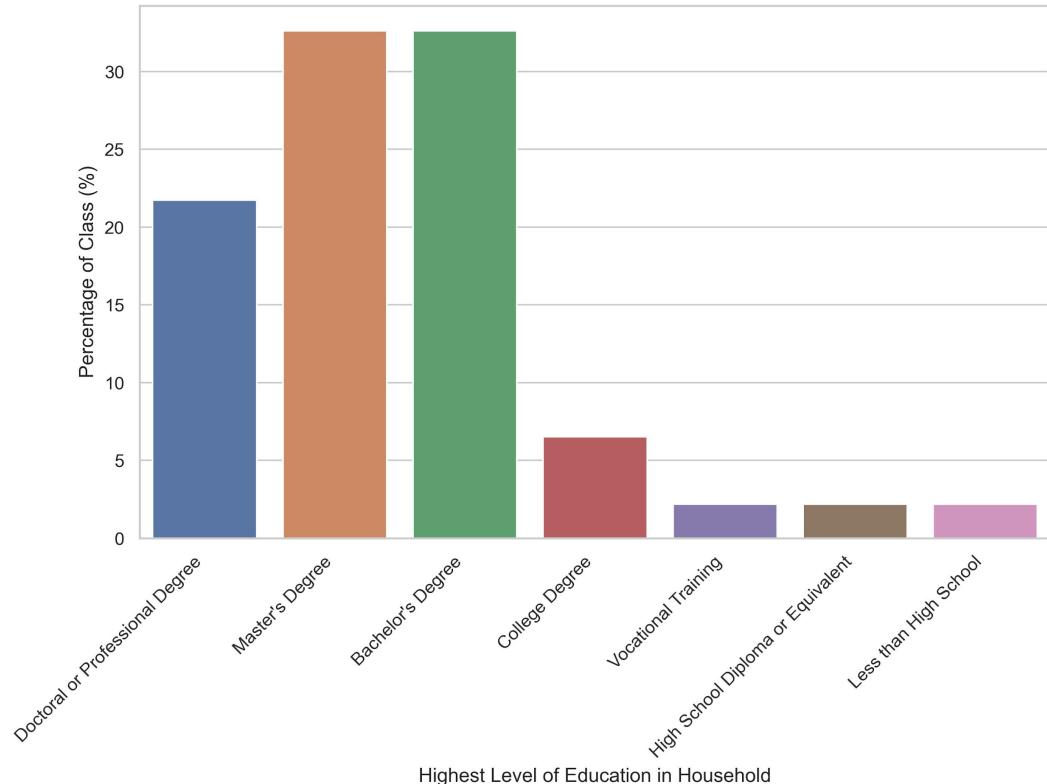
11% of the class were out-of-province students.



Education level of parents

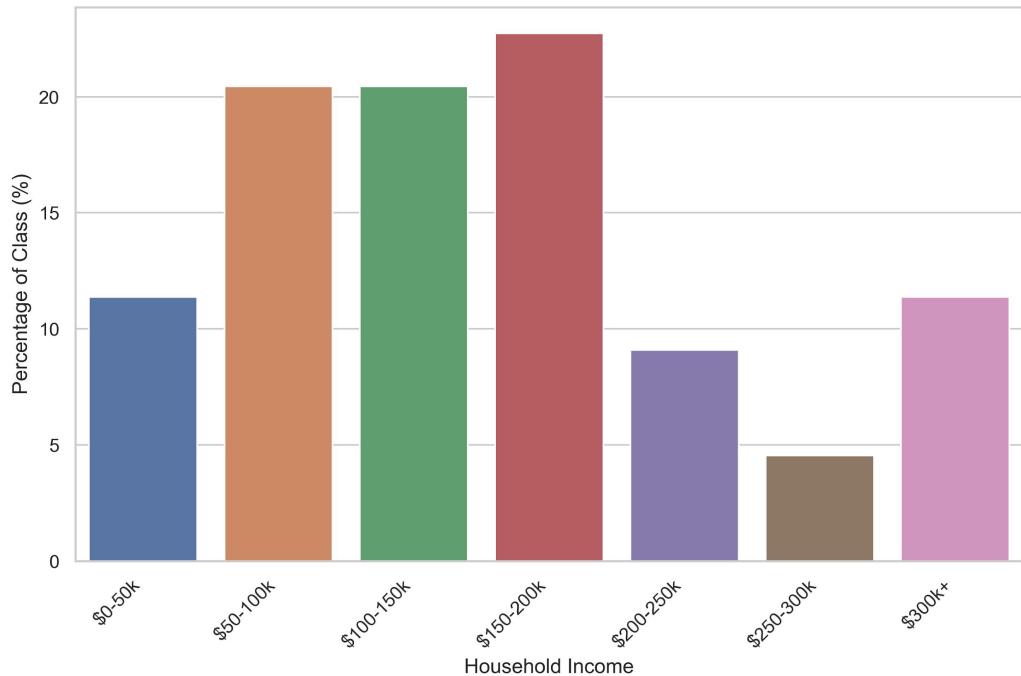
87% of the class had at least one university-educated parent, and **54%** had a parent with some type of post-graduate degree.

60% had at least one parent with a STEM background, as compared to the [2016 Canadian Census statistic of about 25% of bachelor's degrees being in STEM](#).



Family household income

At least **68%** of the class was from a family which earned above the Canadian median annual household income of \$84,950 (2017).



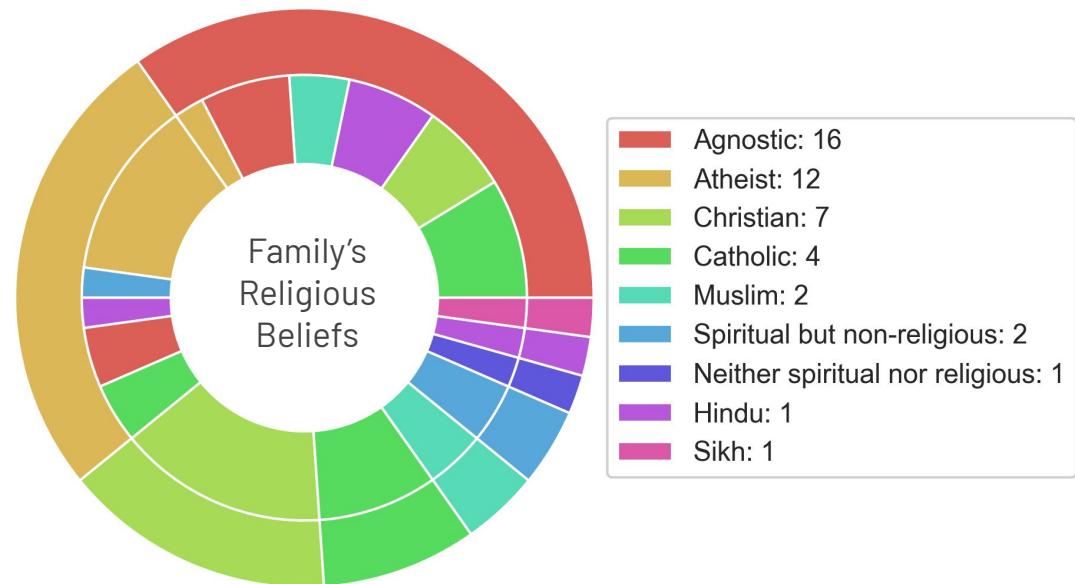
Religious Thought

35% of the class identified as Agnostic, while **26%** of the class identified as Atheist.

57% of the class followed the same religious thought as their family. The remaining students that differed identified as either Agnostic or Atheist.

Note: The outer ring shows the class' religious beliefs, where as the inner circle shows the religious beliefs of the family.

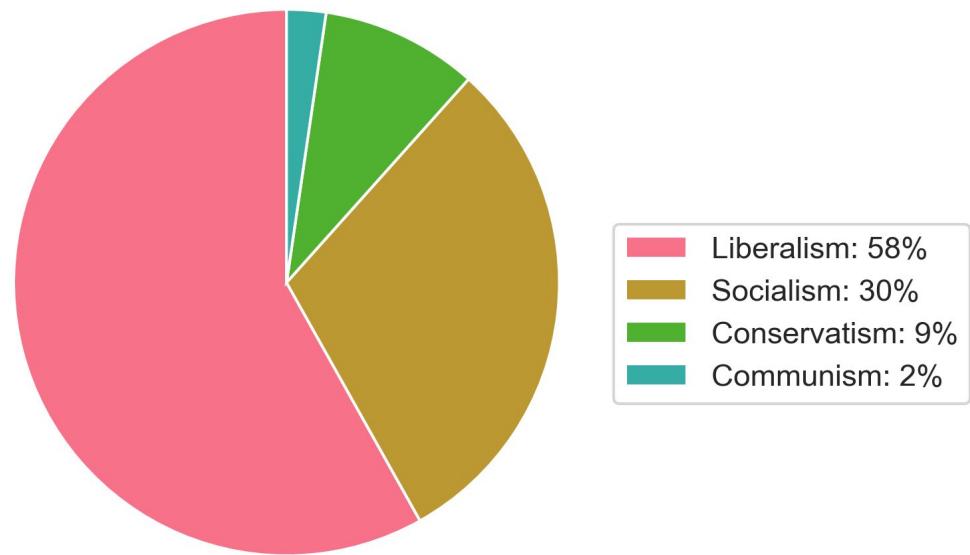
Class' Religious Beliefs



Political Ideology

91% of respondents resonate with left wing ideology, following the progressive tech stereotype.

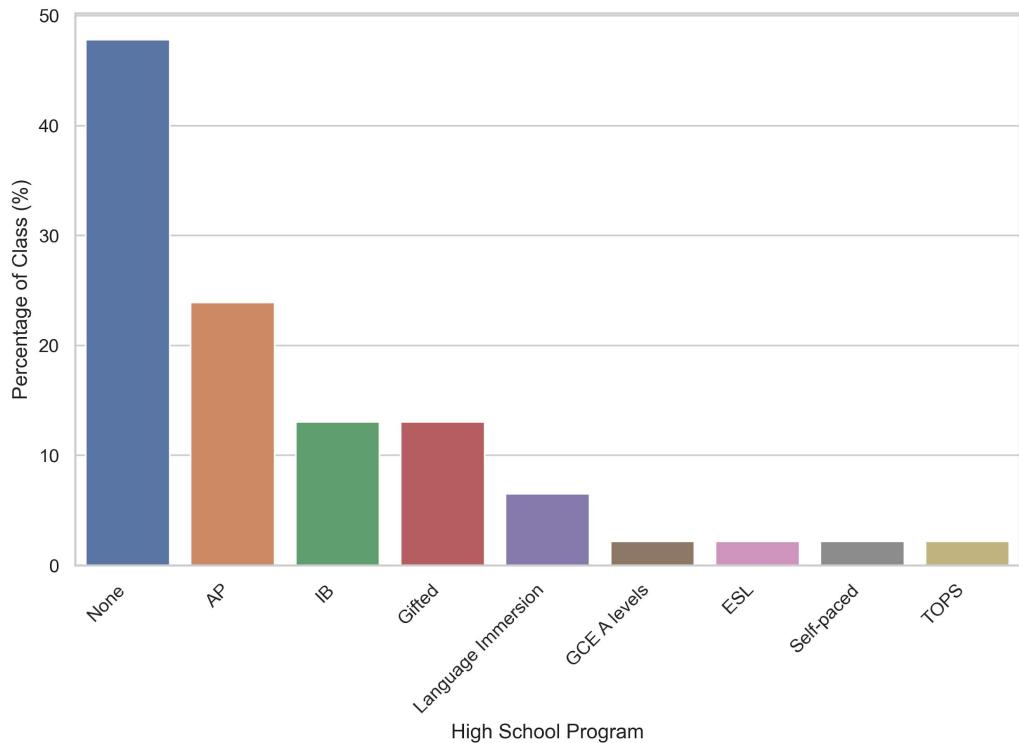
58% of the class resonates with a Liberal point of view, followed by Socialism at **30%**.



High School Programs

52% of the class was enrolled in at least one specialized high school program.

Over a **quarter** of the class was enrolled in a gifted program. In Toronto, gifted students account for 2.6% of students.

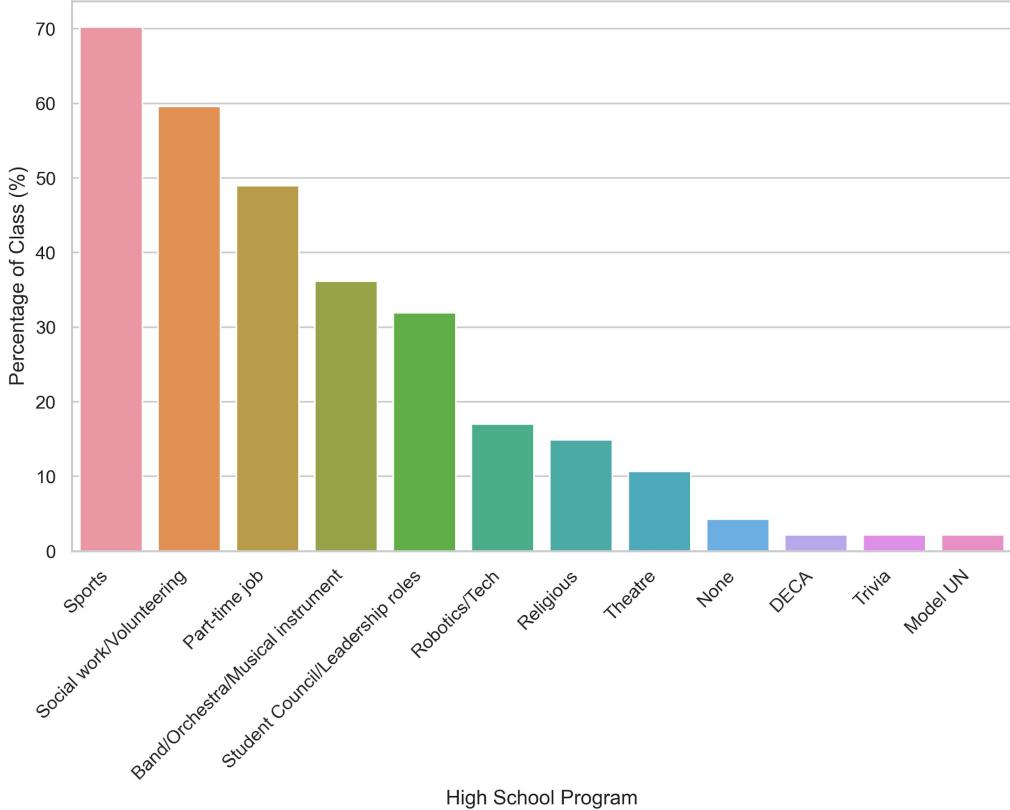


High School Extracurriculars

96% of the class was involved in at least one extracurricular in high school.

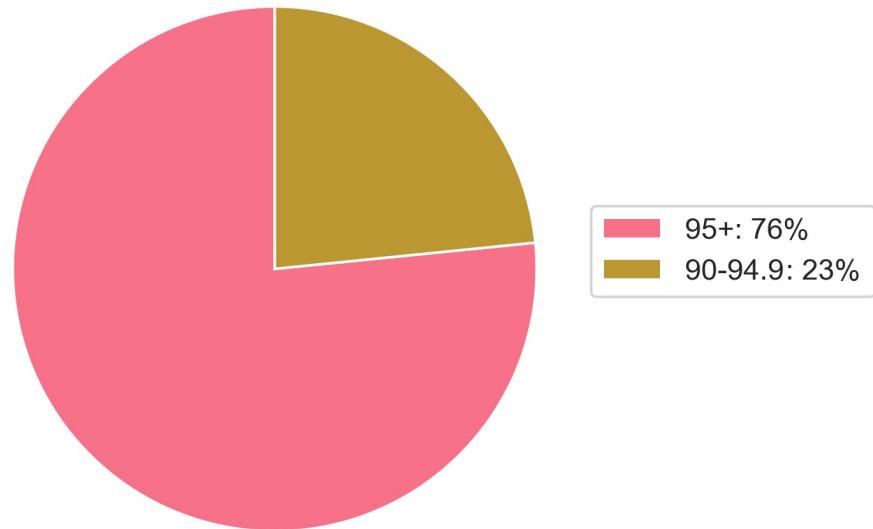
70% of the class played a sport.

Just under **half** the class held a part-time job while in high school.



High School Academics

All students had a high school entrance average above **90%**, with **77%** of the class having an average above 95%.



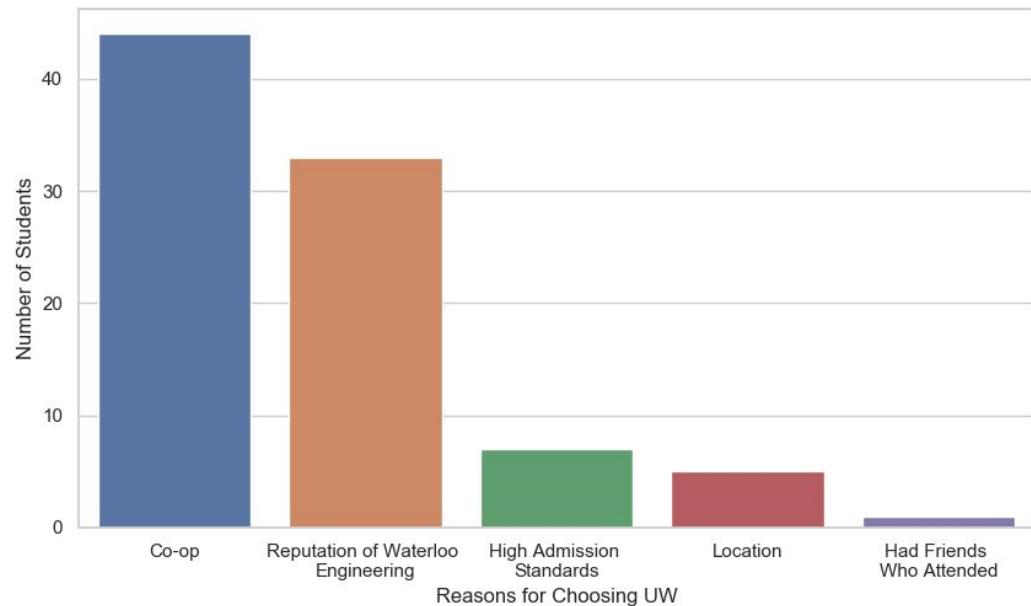
02

Academics

To BME or Not to BME (TBNTB), Courses, Exchange, Specializations, Grades

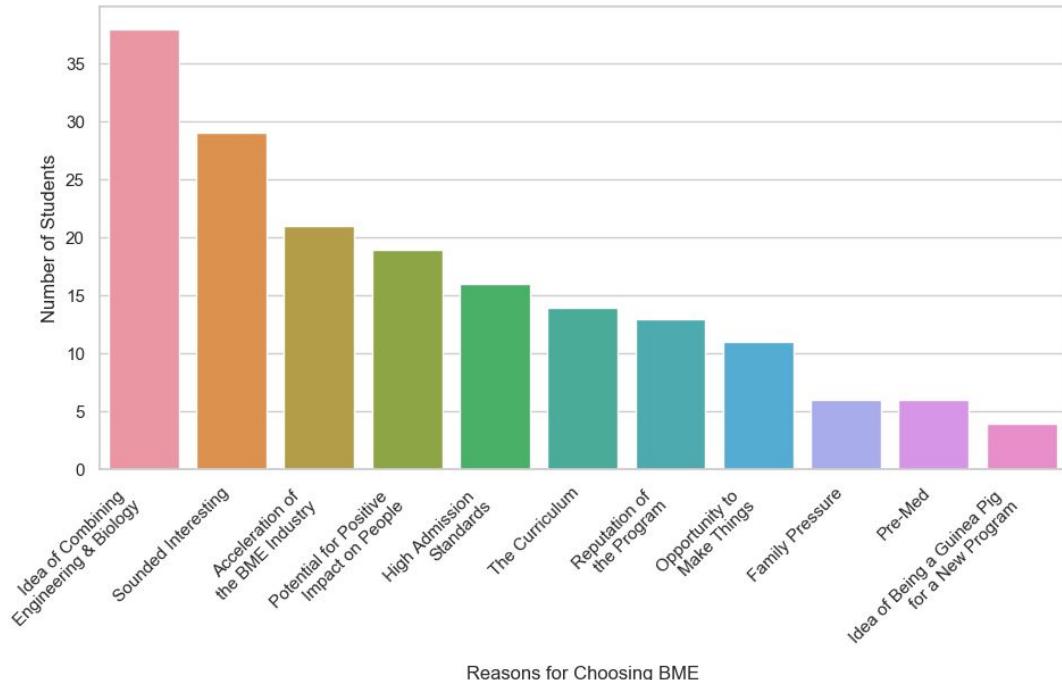
Why did we choose the University of Waterloo in the first place?

For over **90%** of the class, co-op was a motivating factor in enrolling at UW.



Why did we choose Biomedical Engineering in the first place?

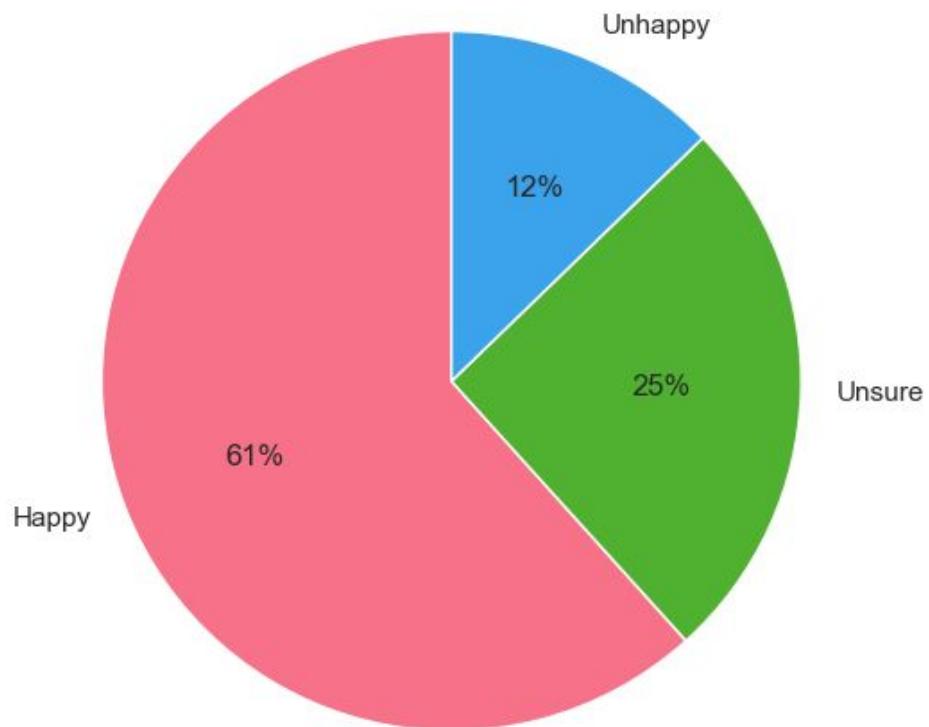
A substantial portion of the motivation for choosing BME was related to the anticipated material that would be learned.



Looking back, are we happy with our choice of program?

Hindsight is 20/20 they say; nevertheless, most of the class was retrospectively happy that they chose BME.

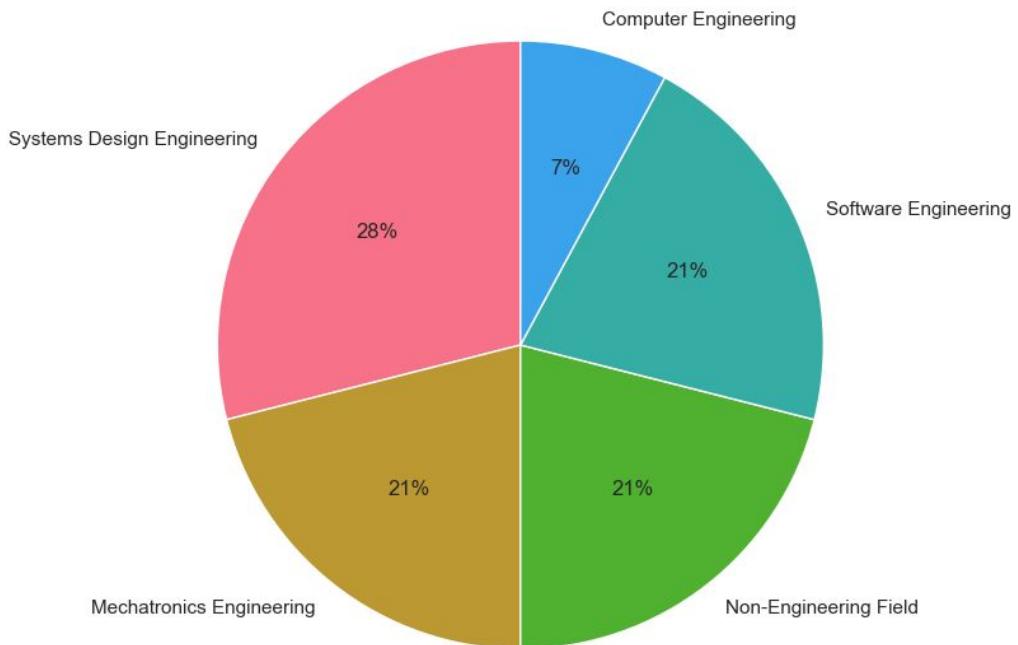
This study was not sponsored by the BME faculty or UW 😊



If we could go back, what UW program would we have chosen?

After exposure to different engineering fields, **65%** of the class identified other Waterloo Engineering programs that were more fitting for them.

17% of the class are interested in having pursued non-engineering fields. Responses included Math, Science, AHS, Kinesiology, and Business.

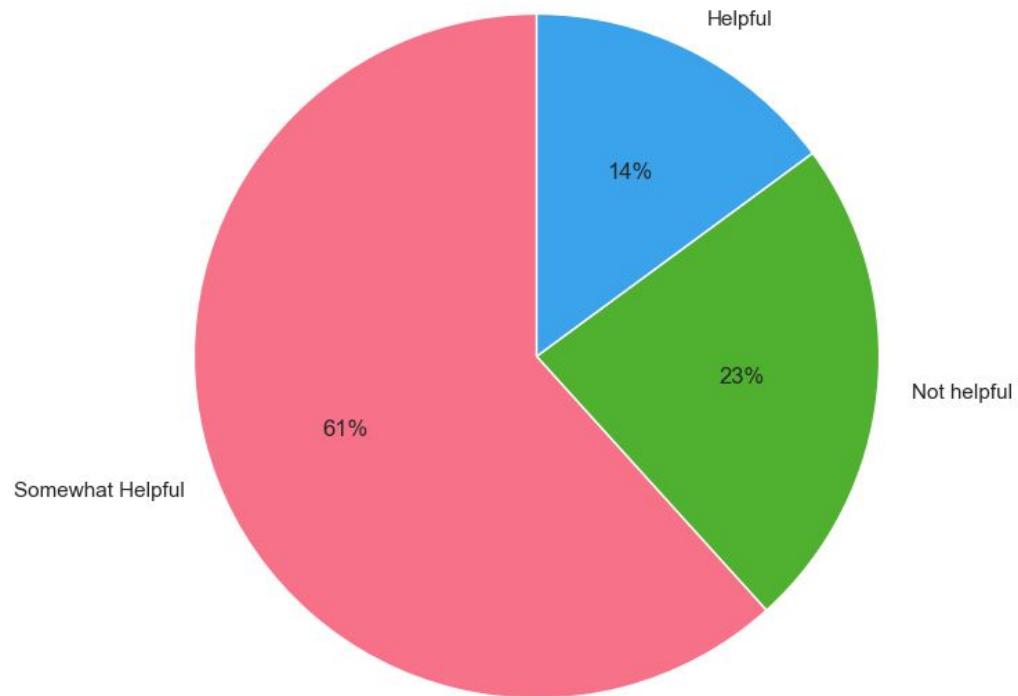


Did the core BME / SYDE courses help to prepare us for our career aspirations?

23% of the class found the core curriculum unhelpful for their career aspirations.

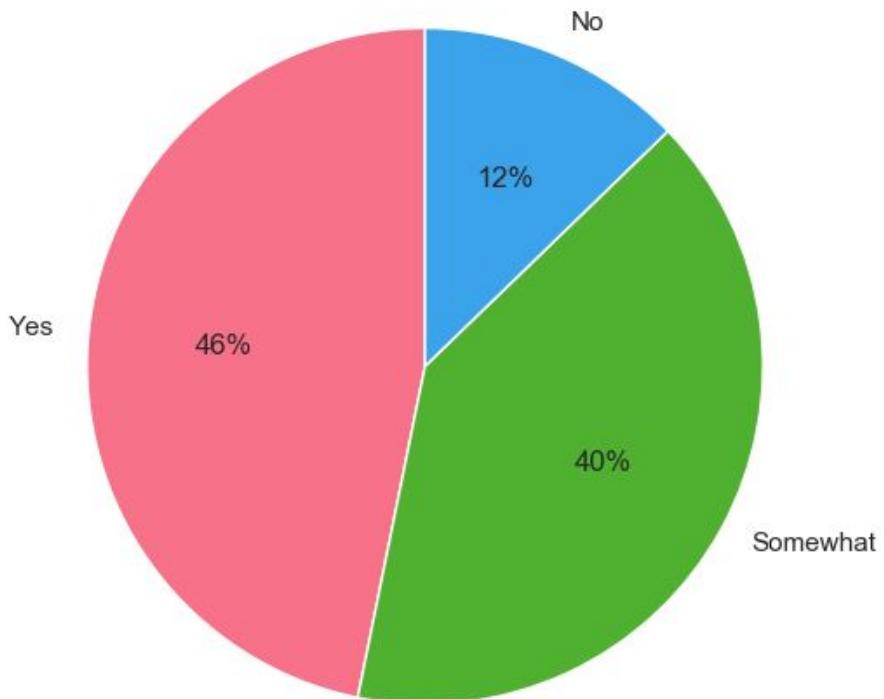
This could be attributed to the lack of flexibility in engineering course selection that limited exploration into identified interests.

The large amount of uncertainty may be because we are not yet able to assess utility of the curriculum at such an early stage of our career.



Are we even interested in biology?

Although **91%** of the class took grade 12 biology, only **87%** are still at least somewhat interested in it after university.



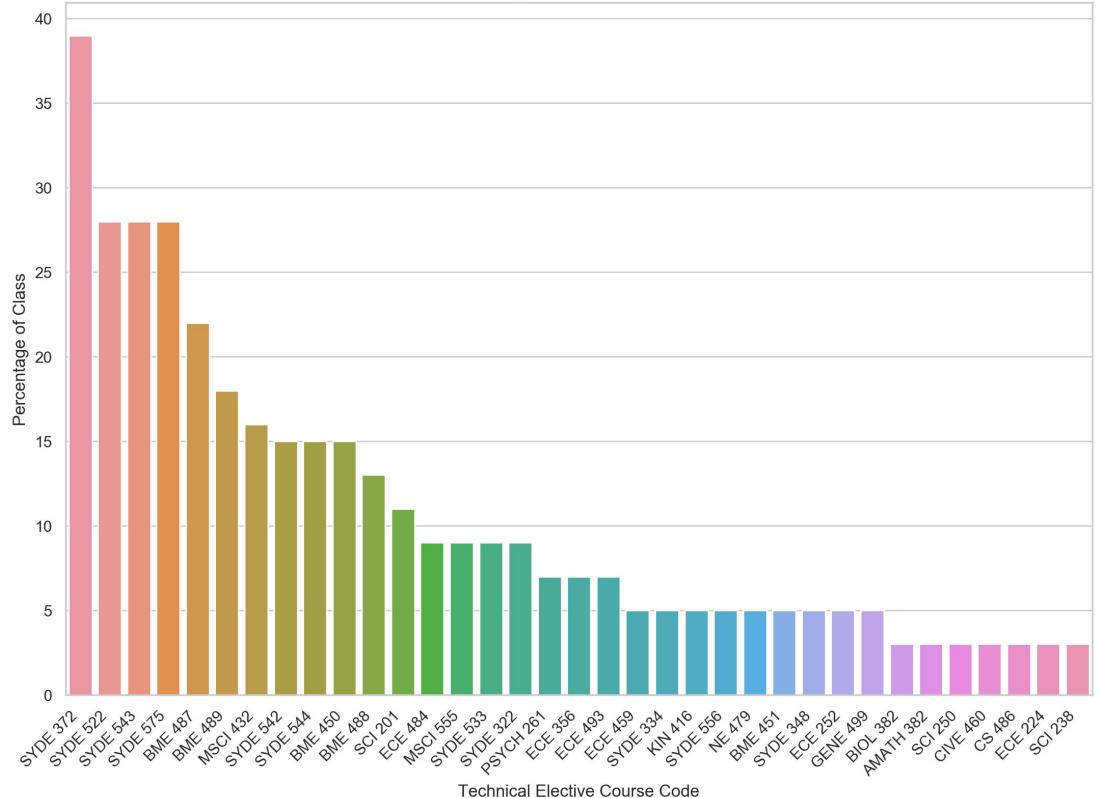
Which technical electives did we take?

With 81 different TEs taken, the top 35 are shown.

The top 5 TEs are:

- SYDE 372 - Pattern Recognition
- SYDE 522 - Machine Intelligence
- SYDE 543 - Cognitive Ergonomics
- SYDE 575 - Image Processing
- BME 487 - Special Topics in Biomedical Engineering

3 of these 5 courses have to do with data processing.

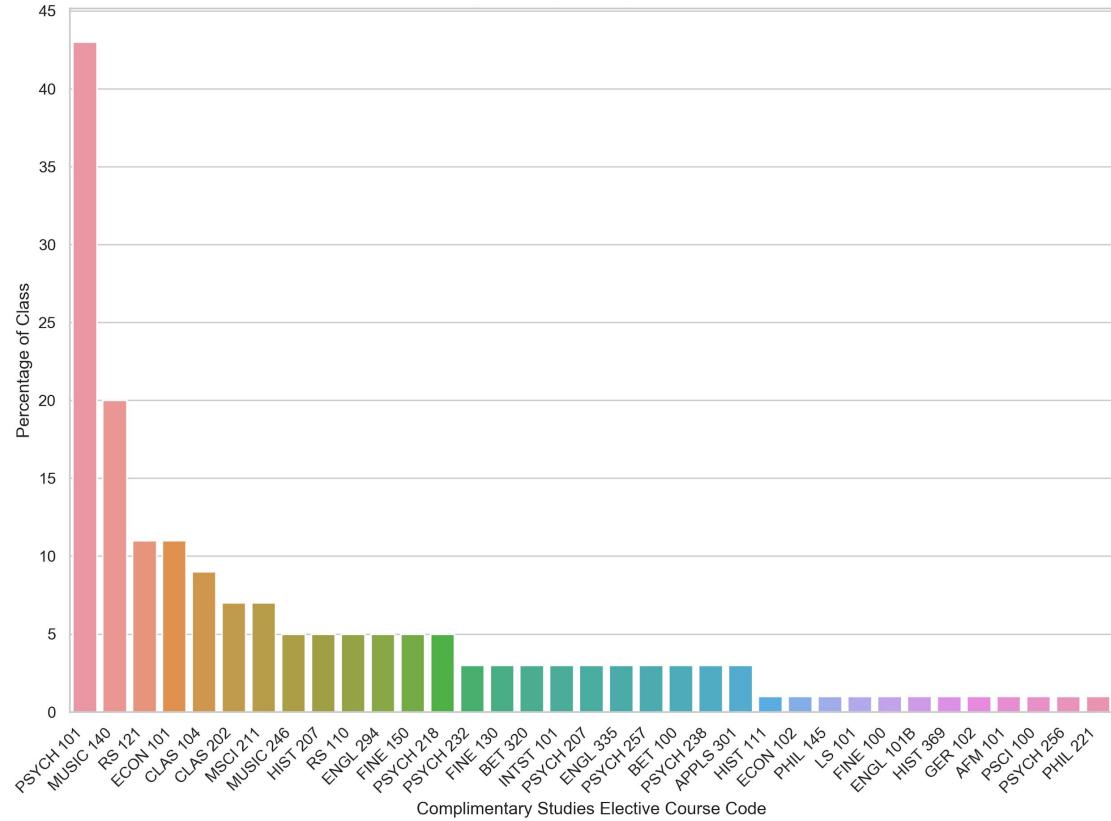


Which complementary studies electives did we take?

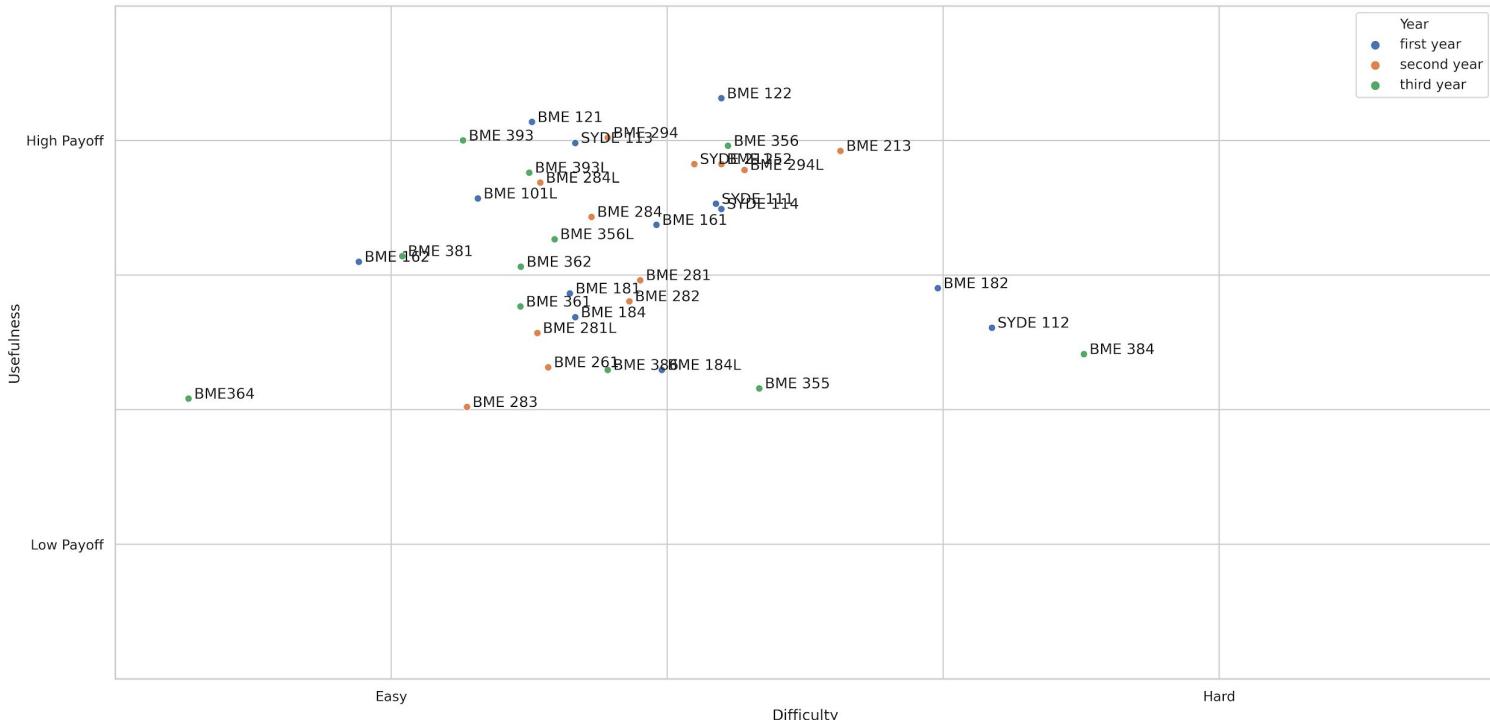
With 73 different CSEs taken, the top 35 are shown.

The top 5 CSEs are:

- PSYCH 101 – Intro Psychology
- MUSIC 140 – Popular Music & Culture
- ECON 101 – Intro to Microeconomics
- RS 121 – Introductory Ancient Greek
- CLAS 104 – Classical Mythology

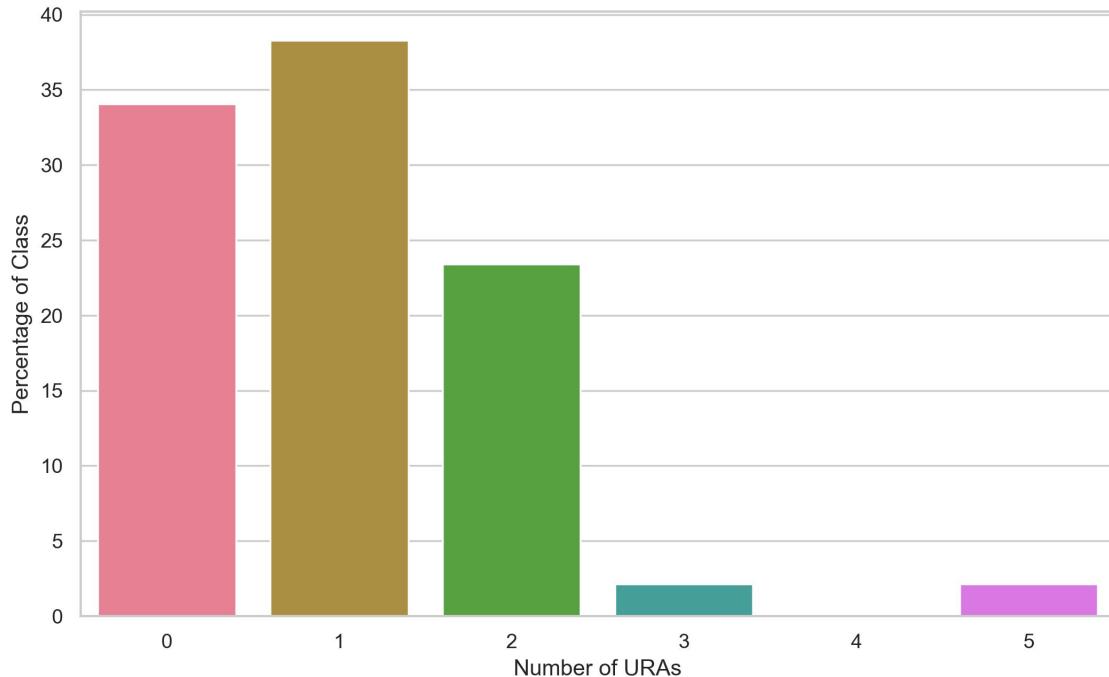


What were our most useful courses?



How many undergraduate research assistant positions did we take on?

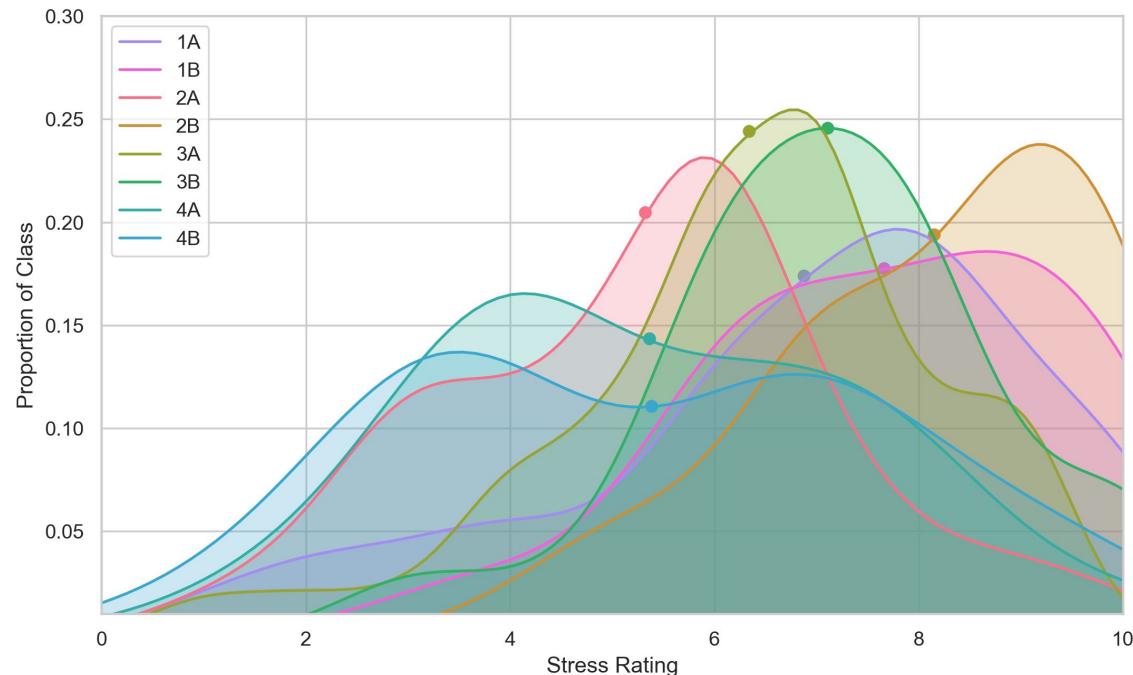
66% of the class was an undergraduate research assistant at least once. However, the number of people who were an URA once drops by **14%** to those who were an URA twice.



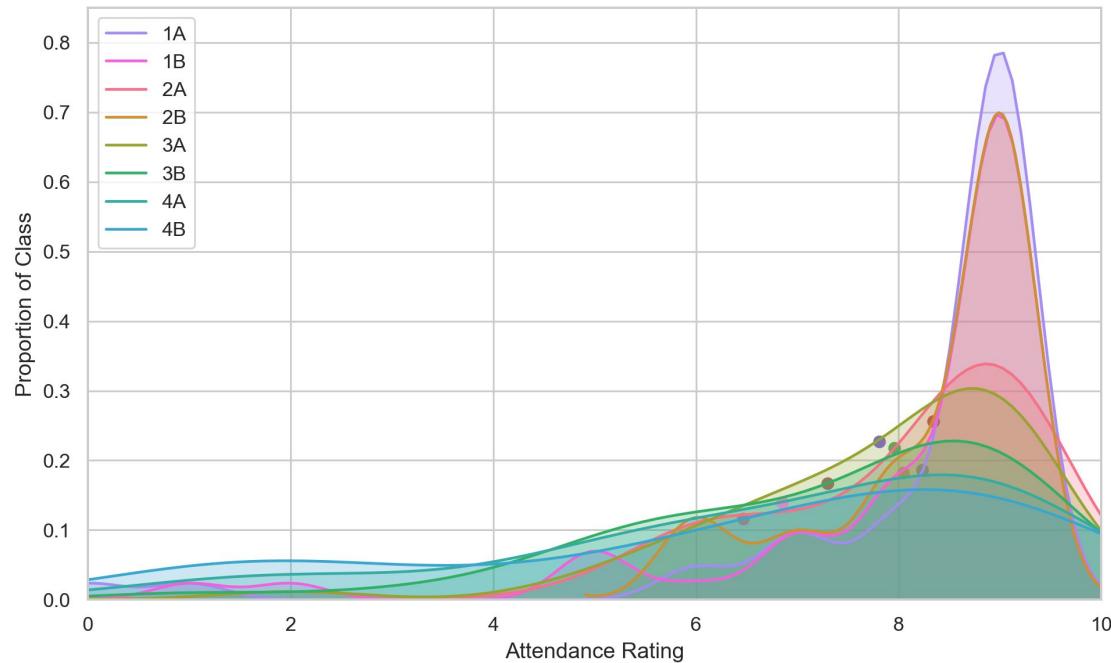
How stressed were we throughout university?

For a given year, the B terms were – on average – ranked as more stressful than the A terms (ex. 2A mean stress = 5.2, 2B mean stress = 8.2).

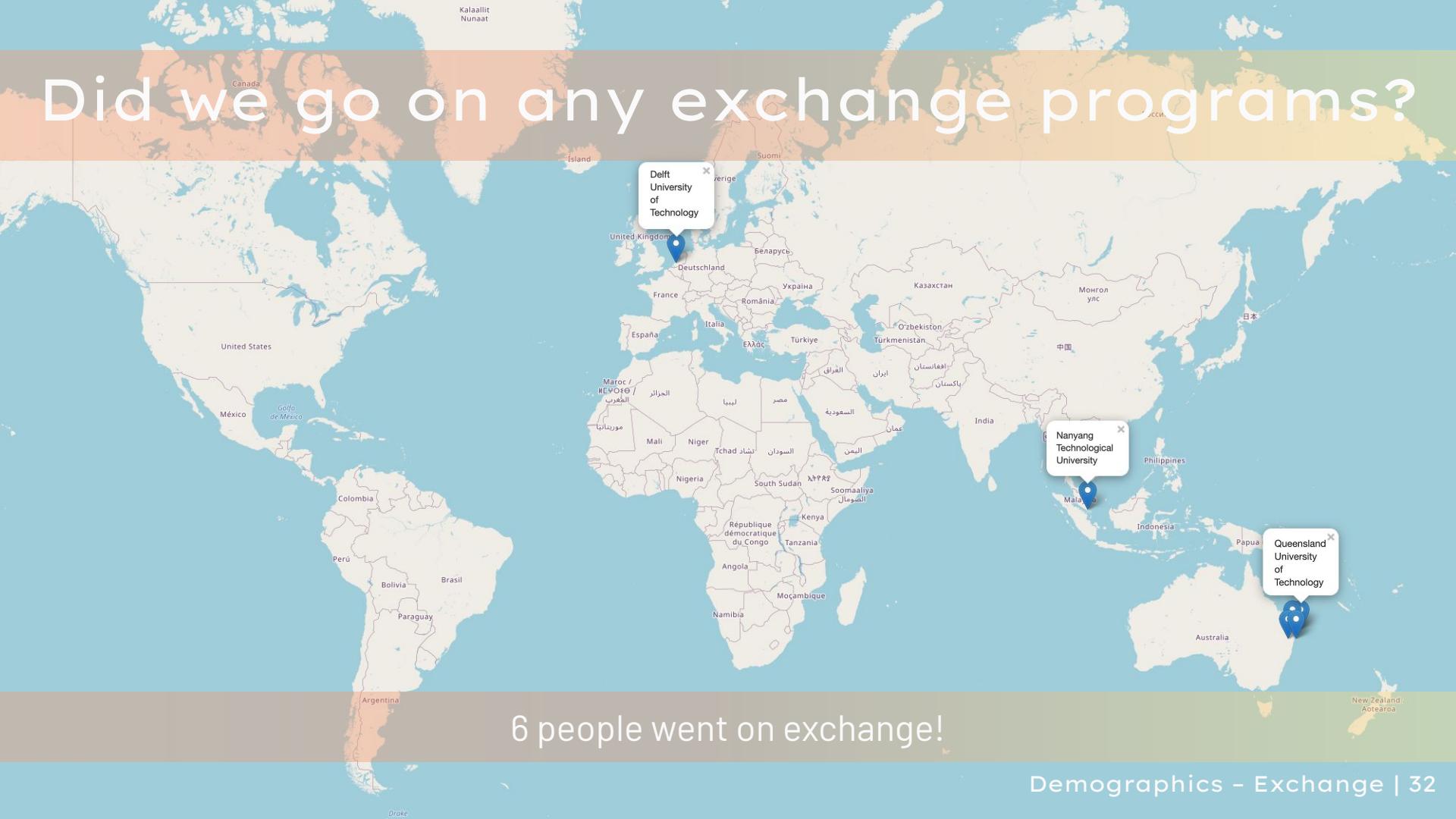
This validates the annually-recited BME 2020 legend that B terms were always going to be more stressful than their preceding terms.



What was our attendance like per term?



Did we go on any exchange programs?



6 people went on exchange!

Did we pursue any options, specializations or additional majors or minors?

Options



4 Management Sciences



1 International Studies in Engineering

Specializations



1 Neural Engineering

Minors

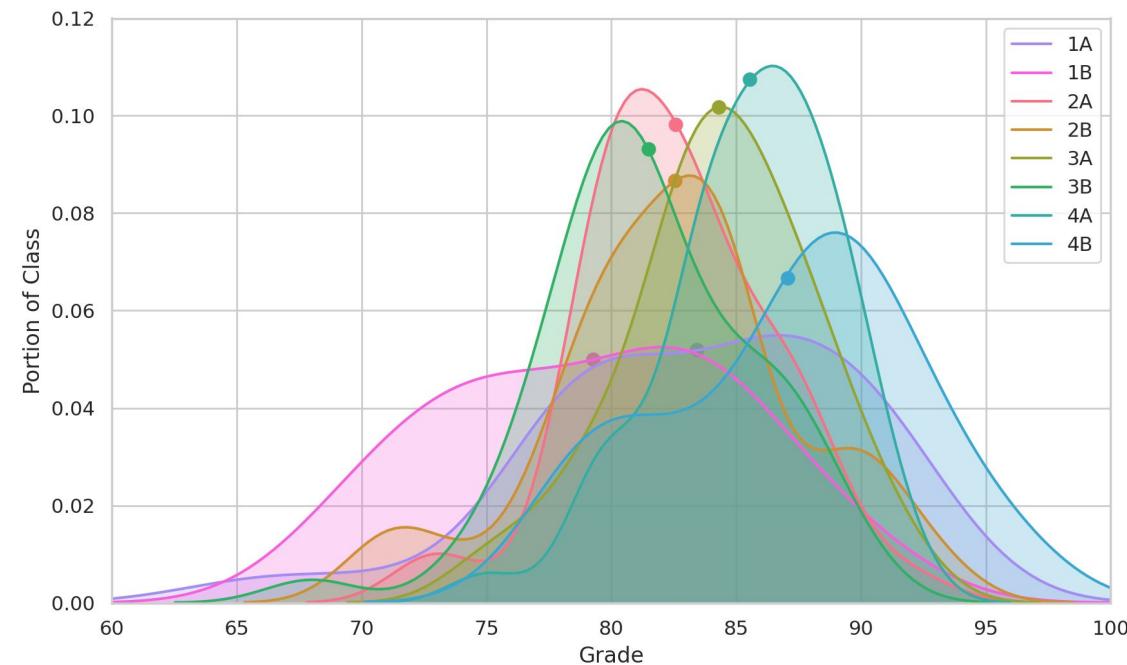


1 Fine Arts

How did our grades change over time?

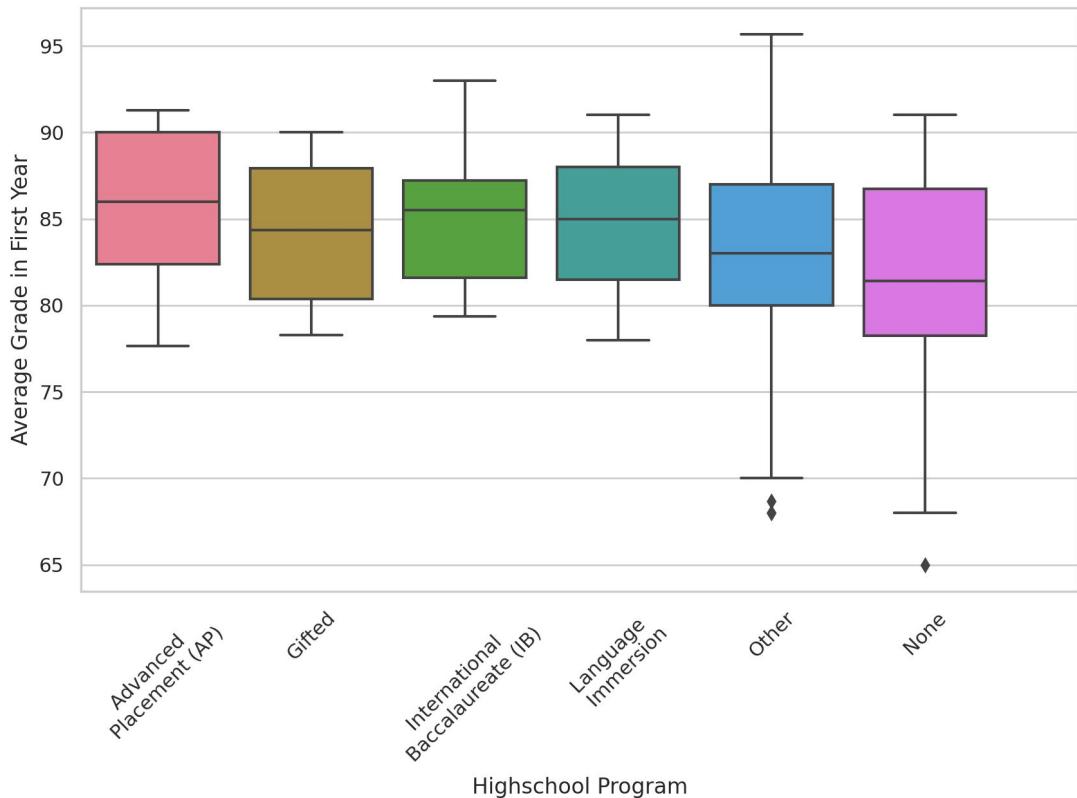
There was a large variance in grades in first year, possibly due to diverse in academic foundations.

Grades deviated again in the final year, likely a result of freedom in selecting elective courses.



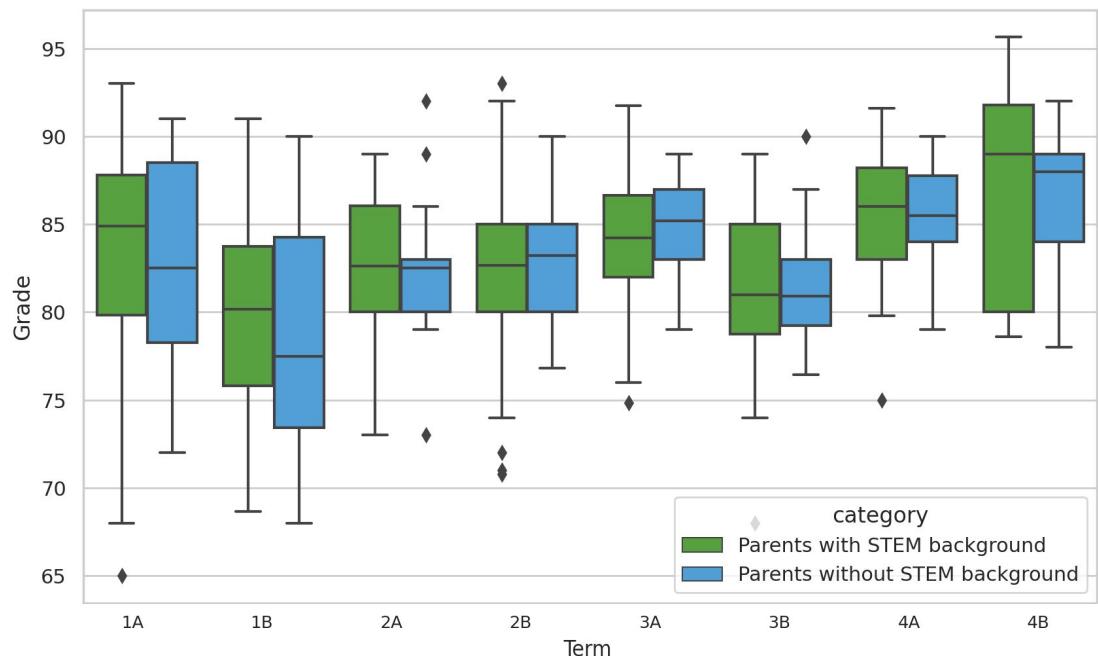
Did high school academic programs influence first year grade?

The average grades of students in any specialized programs was higher than those in none. This could be due to early exposure to university level curriculum.



Did either parent have a STEM education?

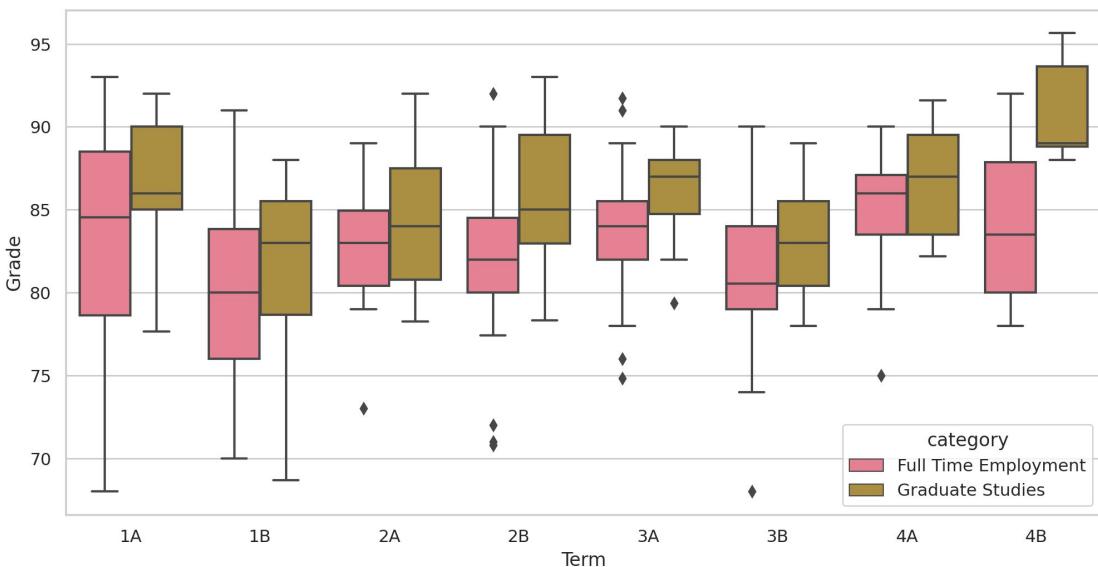
On average, students had a higher first year GPA if either parent had a STEM degree. This disparity was not as pronounced thereafter.



Did future plans influence our grades?

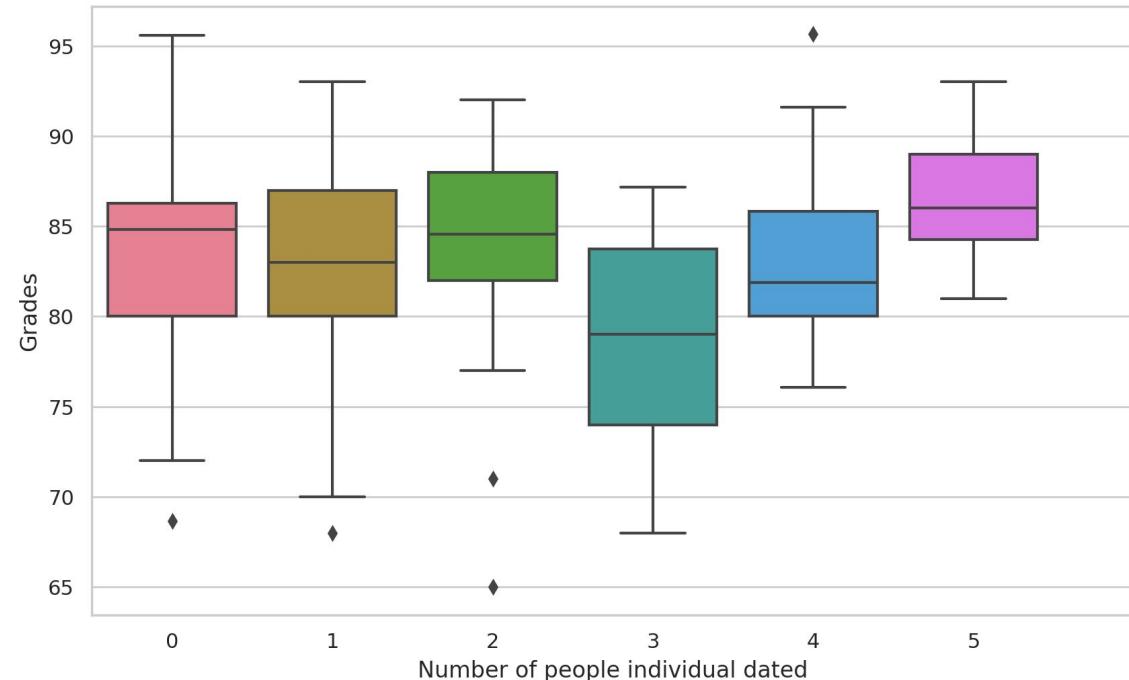
...or did grades influence our future plans?

On average, classmates that are going to grad school consistently had higher grades since first year, even though most graduate schools look at grades in the final year. This may suggest a selection effect where those with higher academic standings become inclined to pursue further studies.



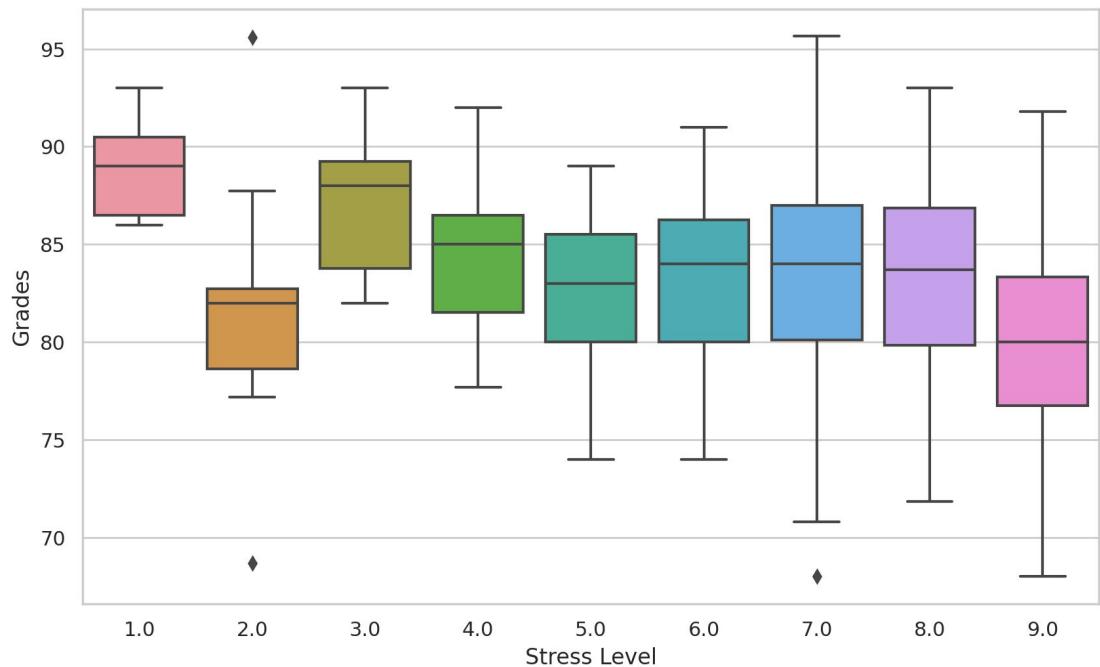
Was there a relationship between our grades and the number of people we dated?

There appears to be no trend, so date however many people you want 😊



Did stress have an effect on GPA?

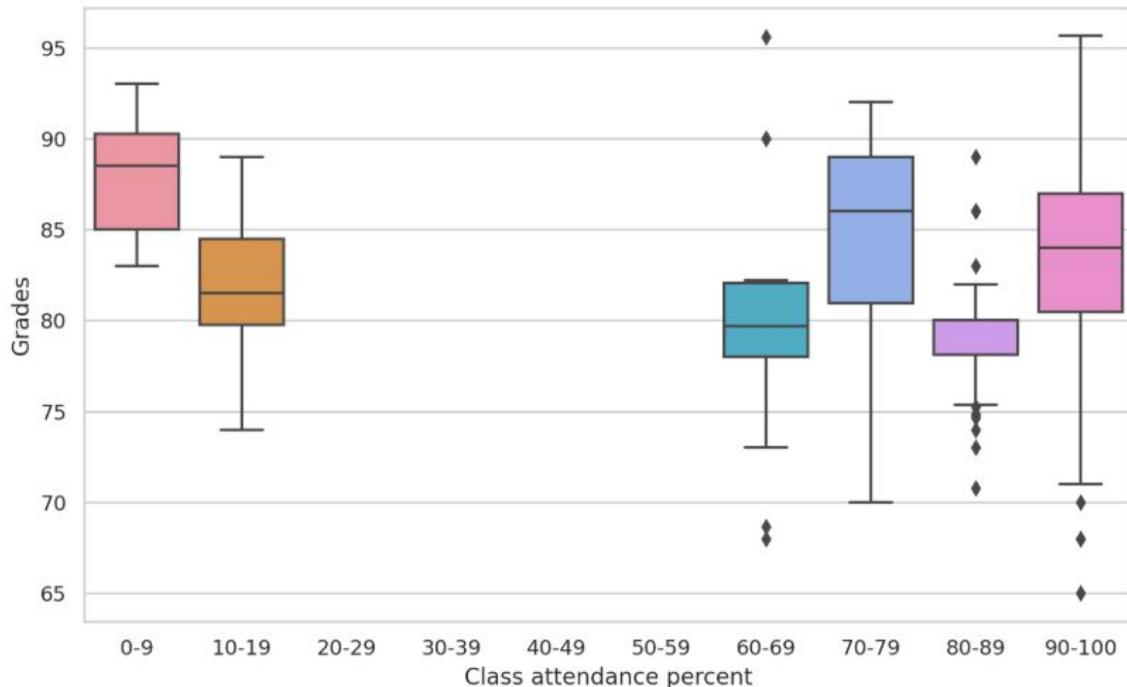
There is no consistent trend for how we perform under pressure, as seen by the lowest grades appearing at both a low and high stress levels.



Was it helpful to attend lectures?

Although those with the highest grades attended most lectures, students who were confident (or lazy? 😊) enough to attend fewer than 10% of the lectures were also able to maintain high grades.

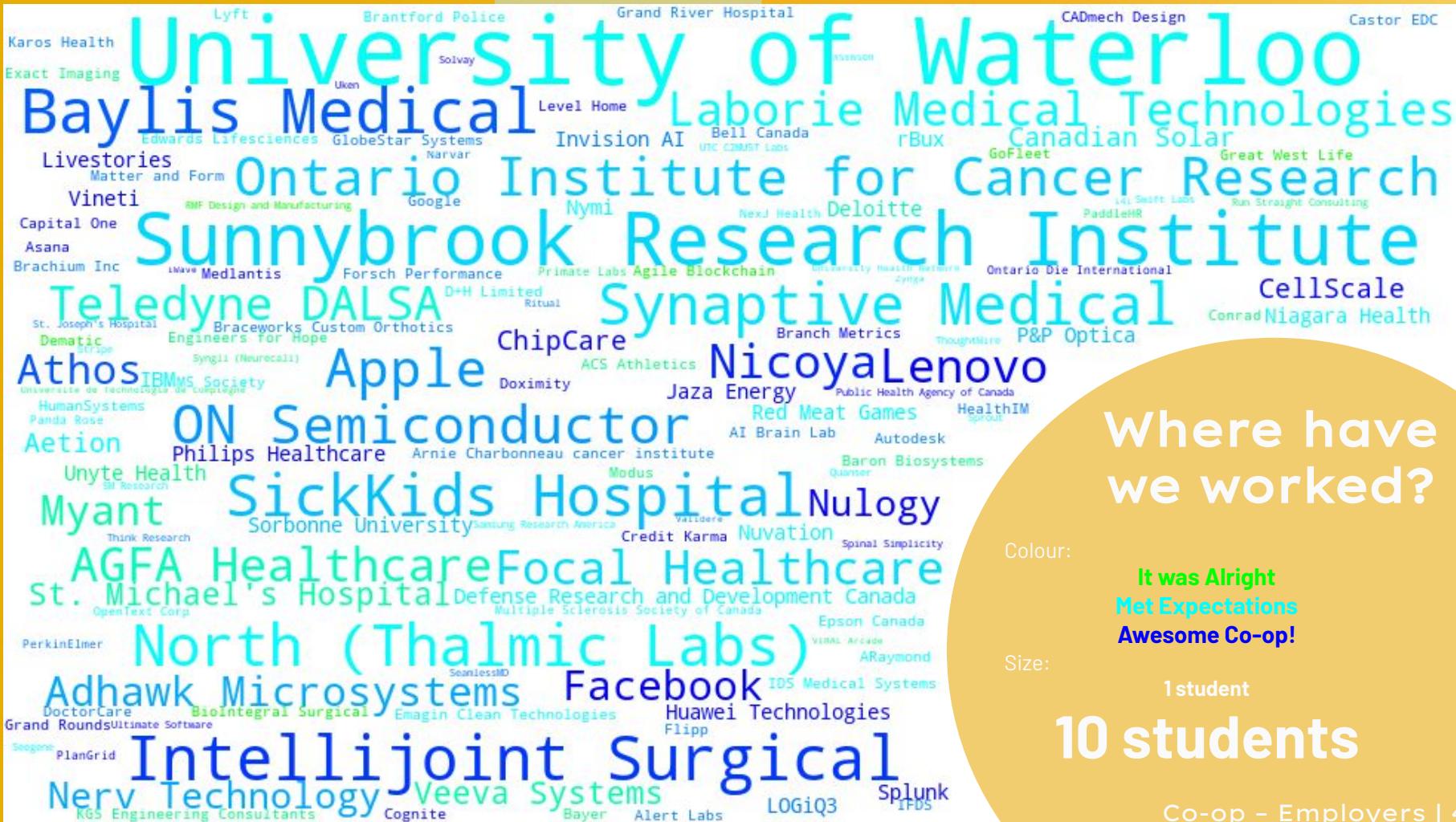
Study strategies should be selected to match each student.



03

Co-op

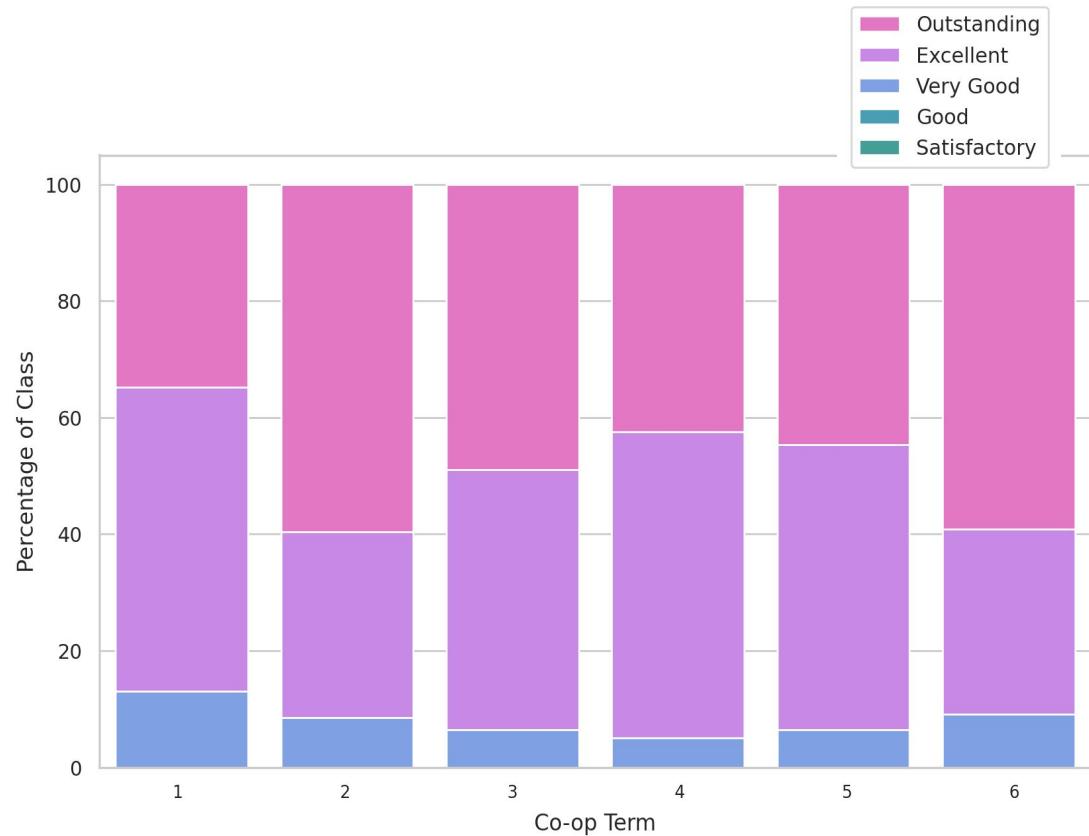
Employers, Job Roles, Locations, Takeaways, Salaries



Did employers like us?

Our second and sixth co-op terms had the highest number of 'Outstanding' ratings given.

No respondent received an evaluation below Very Good.



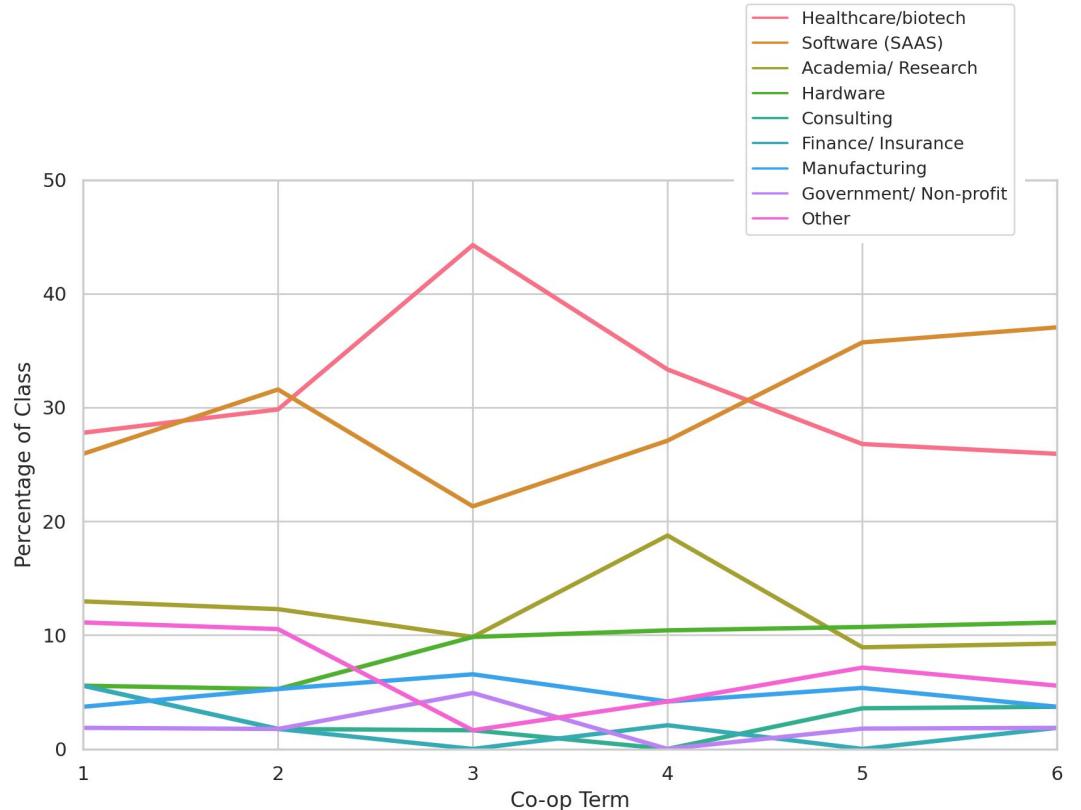
Do BMEs actually work in healthtech?

38% of our co-op positions were within the biotech/healthcare industry.

85% of the class had at least 1 work term within the biotech field.

Our second most common industry was software, which could be the result of the high number of software jobs available on Waterloo Works.

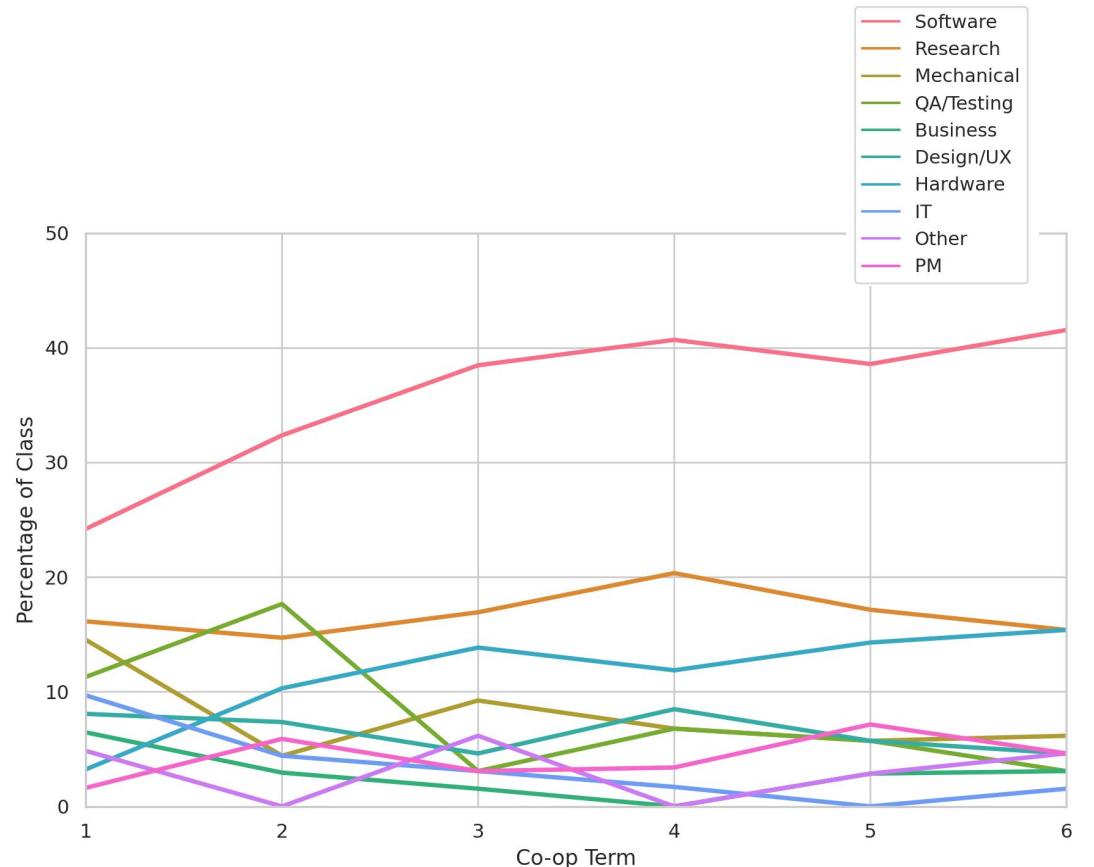
Research positions are significantly more common in our program than others, as seen in the SYDE industry breakdown.



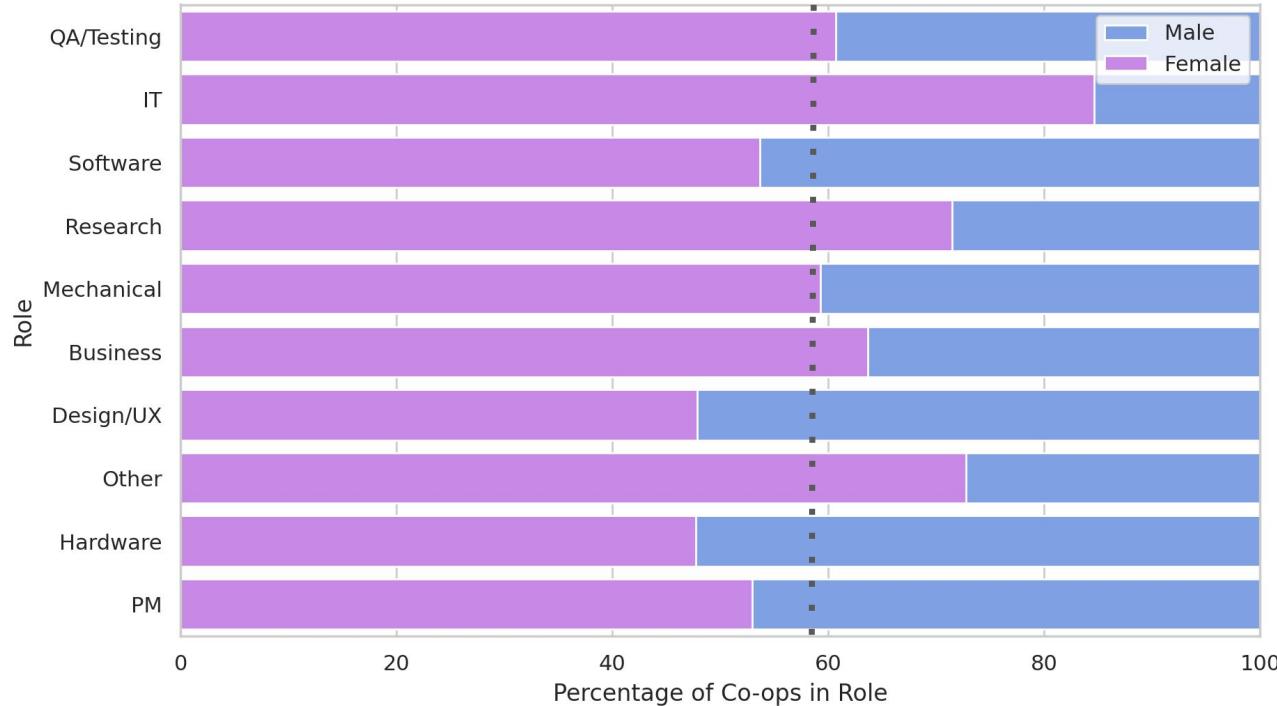
Was there an evolution in the roles we chose?

There was a decrease in QA and IT positions, potentially being replaced with the increase in software development roles.

The number of hardware positions increased later into university, as the positions tend to require more experience.



Do different genders prefer different job roles? Or do different roles select for a given gender?

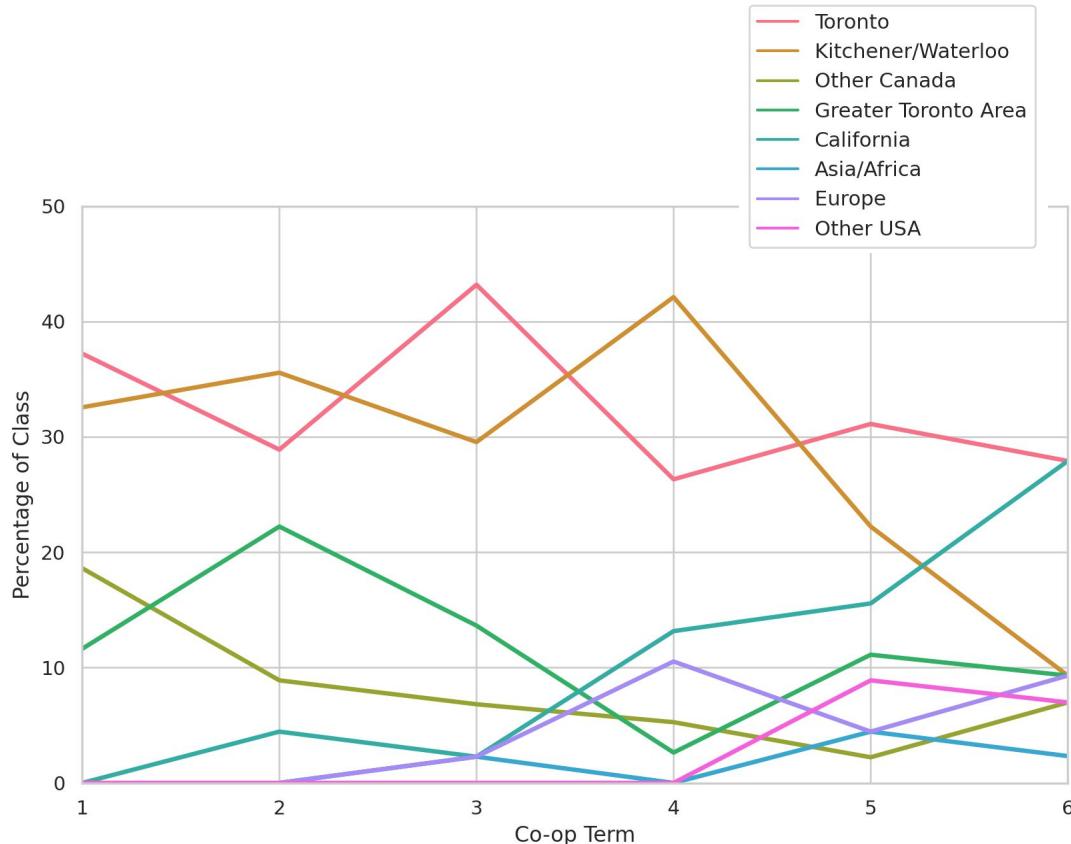


*dotted line indicates the gender median

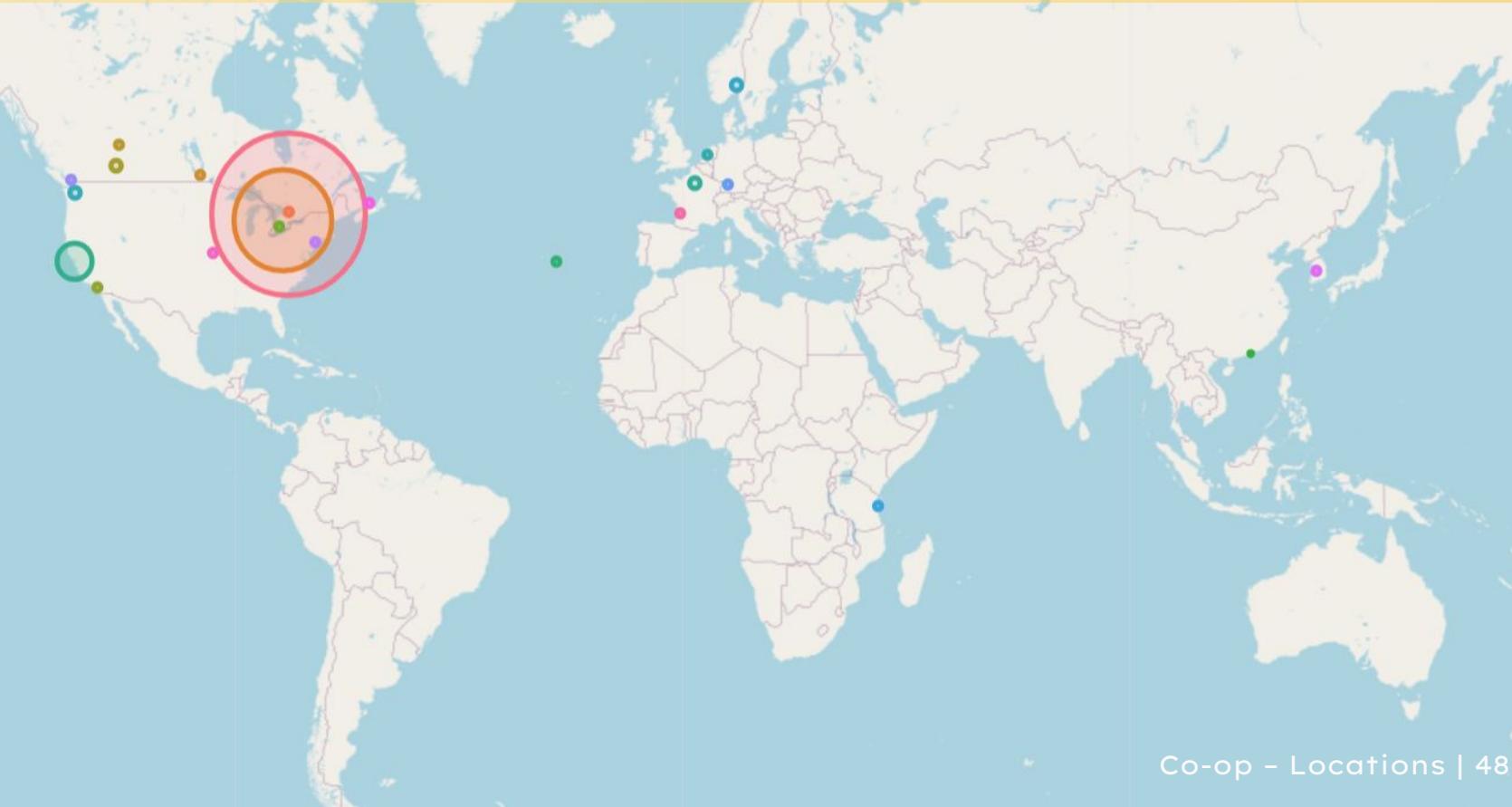
Where have we worked?

51% of our class has had international co-ops.

For the first co-op term we had no international placements. But by the last term, we had as many in Waterloo as Europe, and as many in California as in Toronto.



Where have we worked?

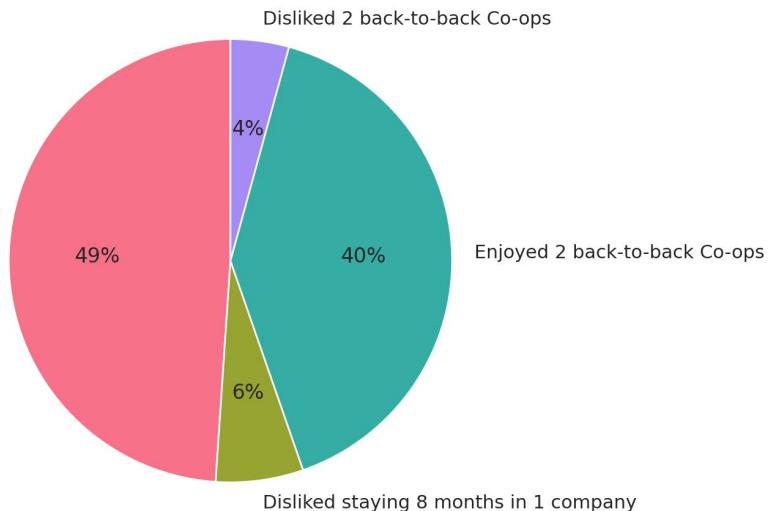


How did we feel about our 8 month co-op?

About **half** the class chose to do an 8 month co-op vs 2 back-to-back.

Students tended to be happy with the direction they chose.

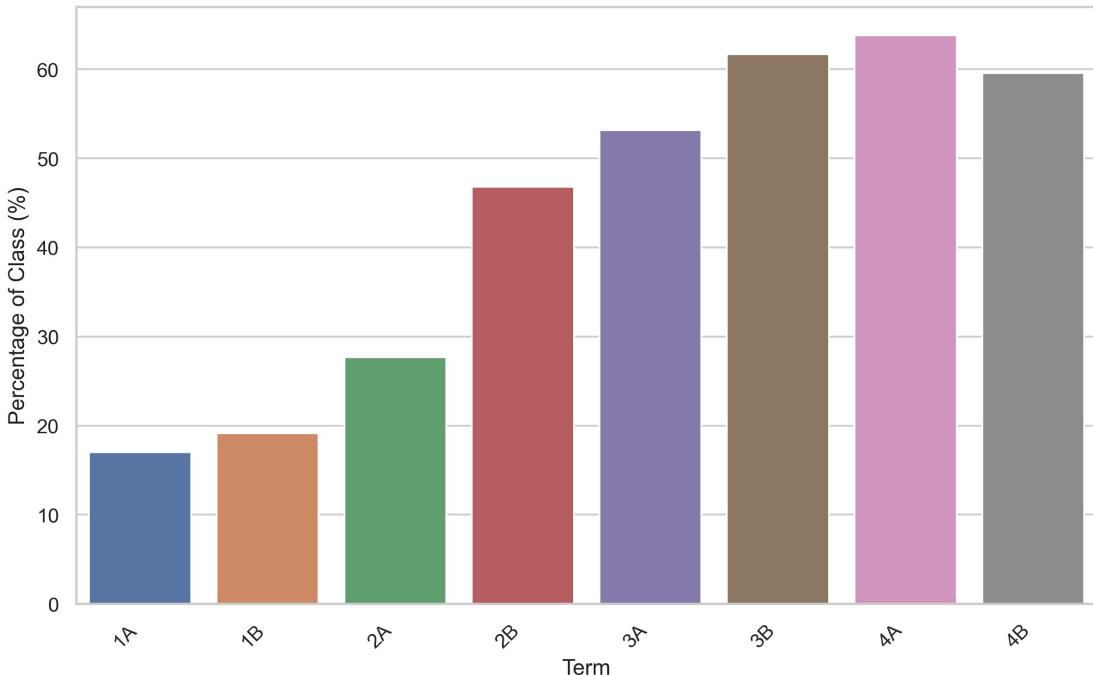
Enjoyed staying 8 months in 1 company



Self-funding

17% of the class self-funded their education in the first term.

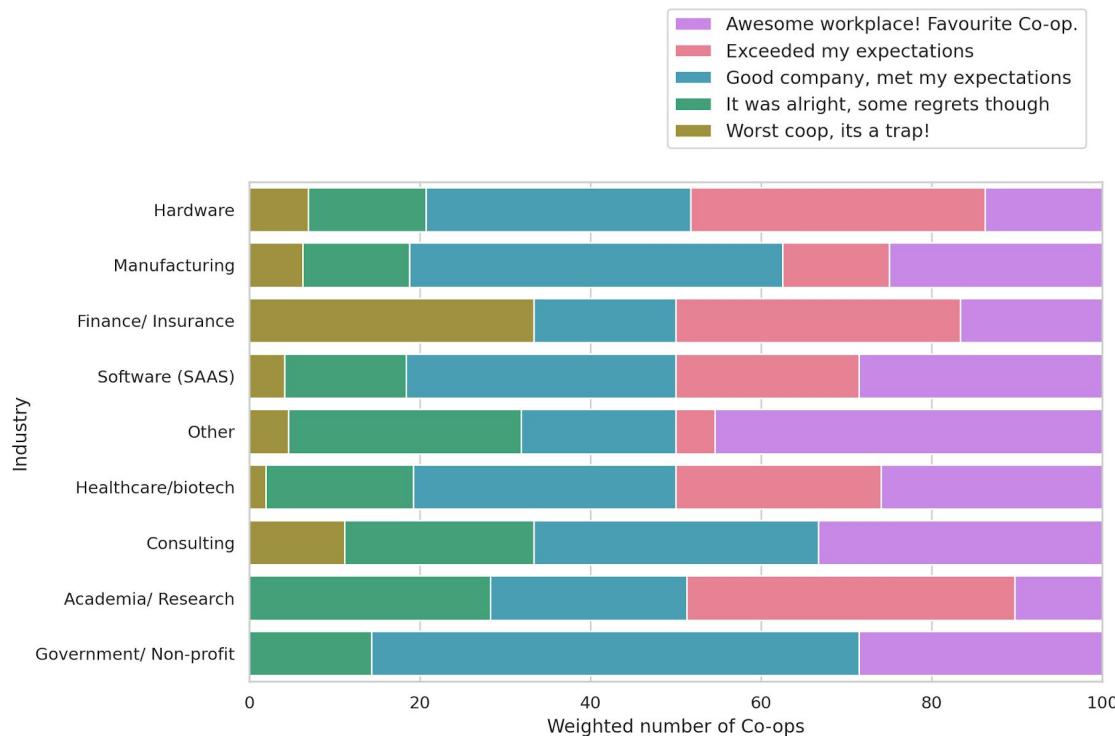
This number increased to **60%** of the class in the last term, potentially due to funds acquired through co-op.



Did the industry affect how much we enjoyed the term?

Industry seemed to have a minimal effect on our enjoyment of the co-op term, though Finance did receive the most “worst co-op” ratings.

Note: The number of co-ops for each industry has been normalized.

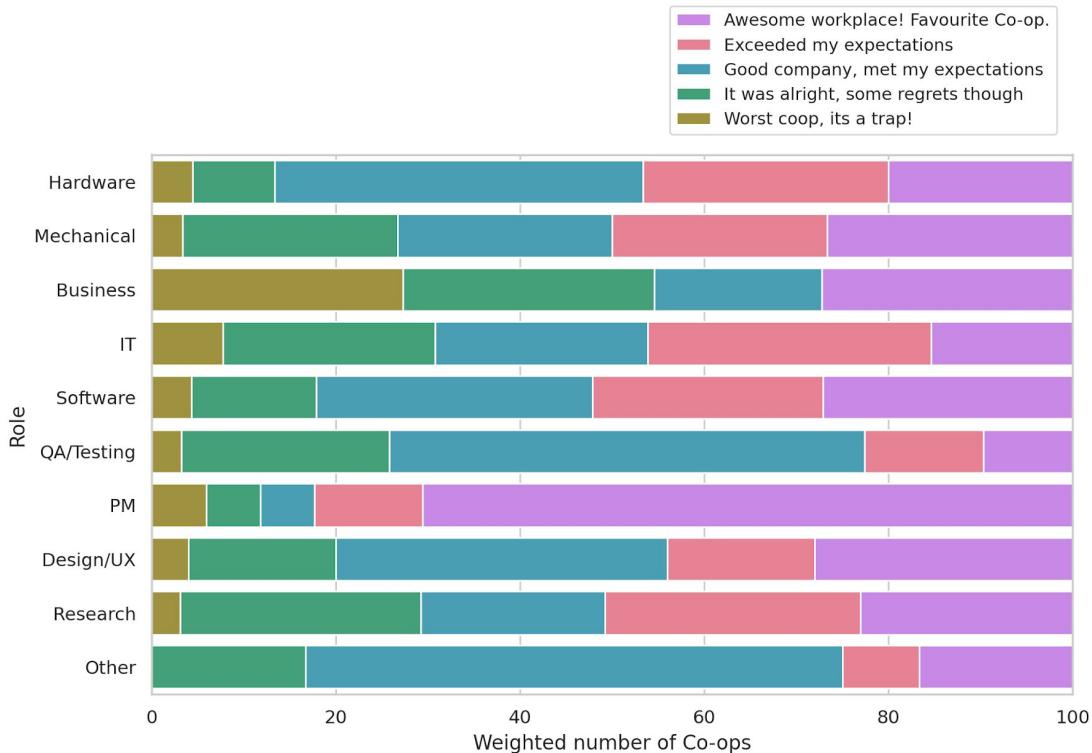


Did our role affect how much we enjoyed the term?

The least enjoyed roles were Quality Analysis/Testing and Business, while the most enjoyed role was by far Project/Product Management.

Note 1: Only **6%** of co-ops were PM roles.

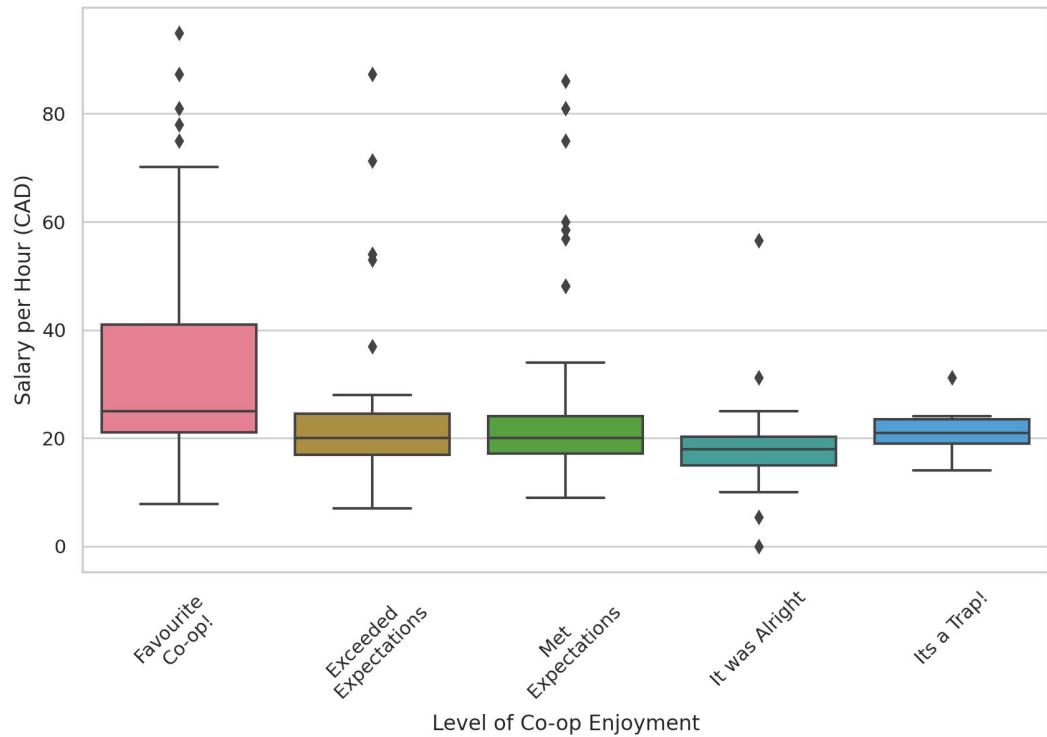
Note 2: The number of co-ops for each industry has been normalized.



Did salary in the last couple terms affect how much we enjoyed the term?

On average, salary did not affect how much we enjoyed the co-op.

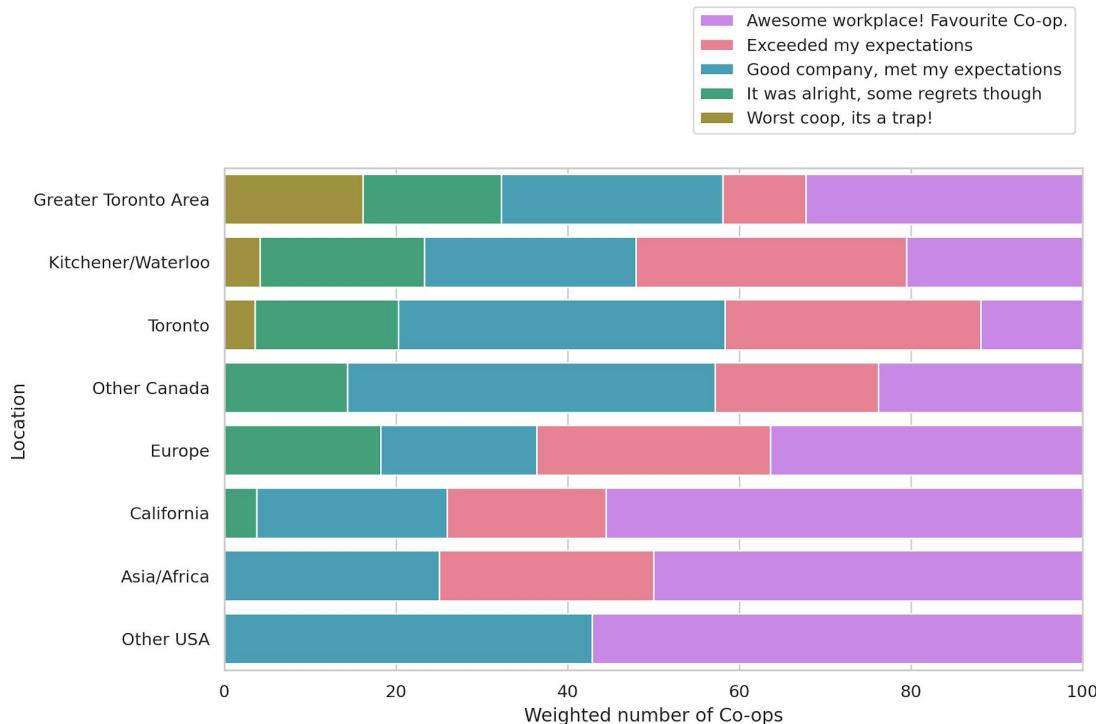
The higher rated positions displayed more variance in pay.



Did location affect how much we enjoyed the term?

Yes! Location seems to have had the largest effect on our enjoyment of the work term, as all of the "worst co-op" ratings occurred in Ontario. Looks like our class enjoys the novel experiences that come with a new environment.

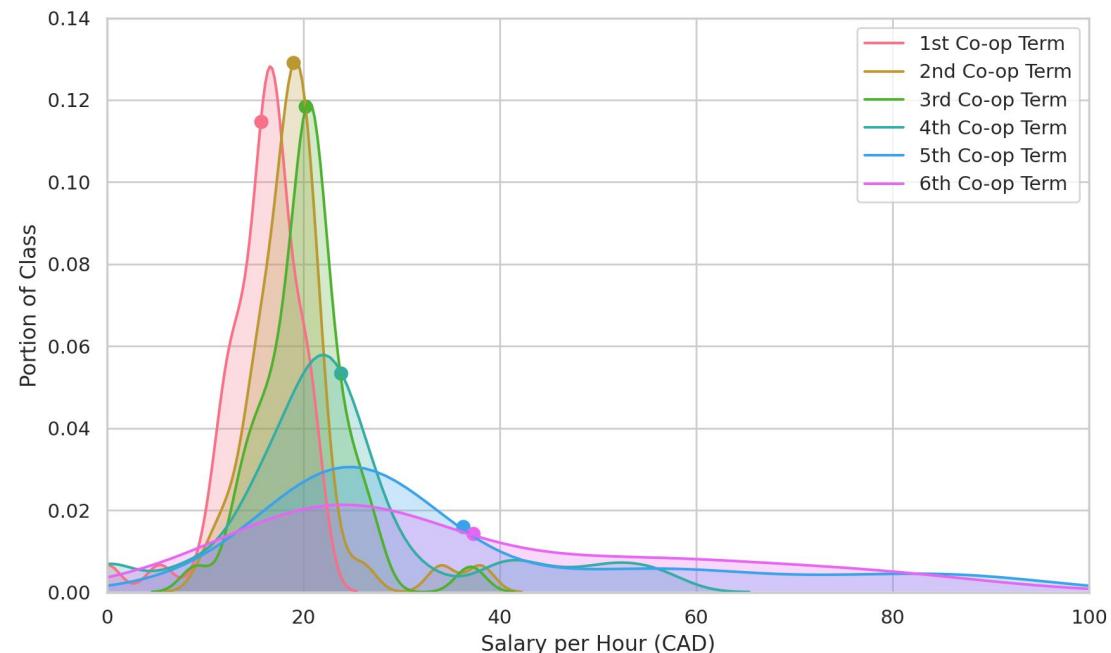
Note: The number of co-ops for each industry has been normalized.



How did our salaries change over time?

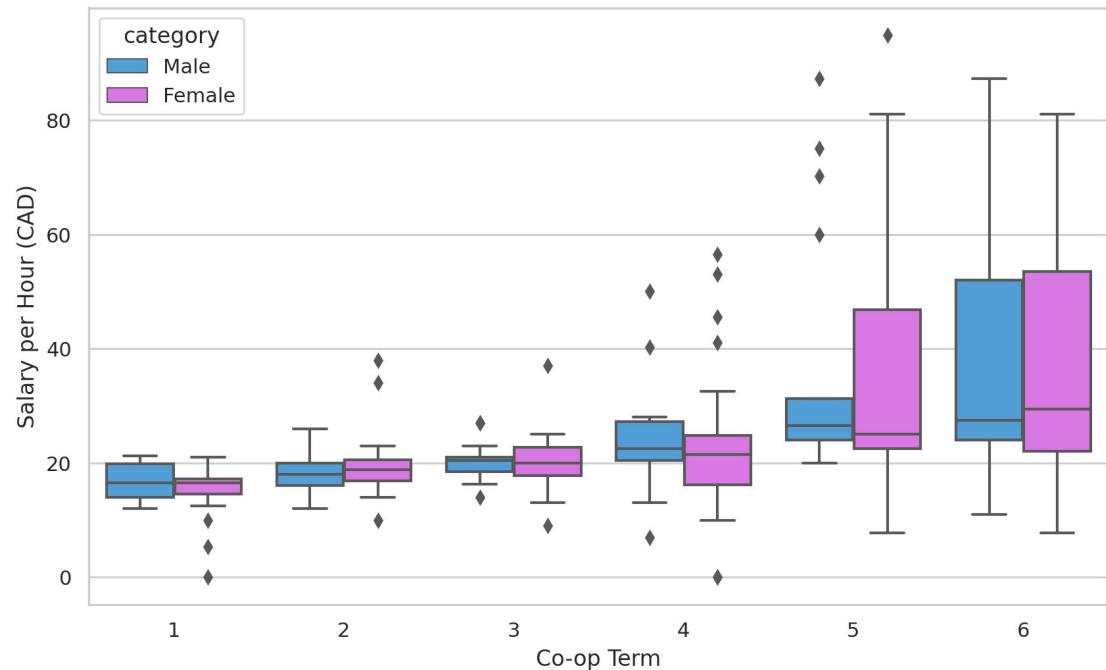
As a class we made **\$3,112,687**, if assuming students worked for the minimum 12 weeks.

All first term co-ops were in Canada and paid around [UW's recommended salary](#). As students began to leave the country, the variance grew.



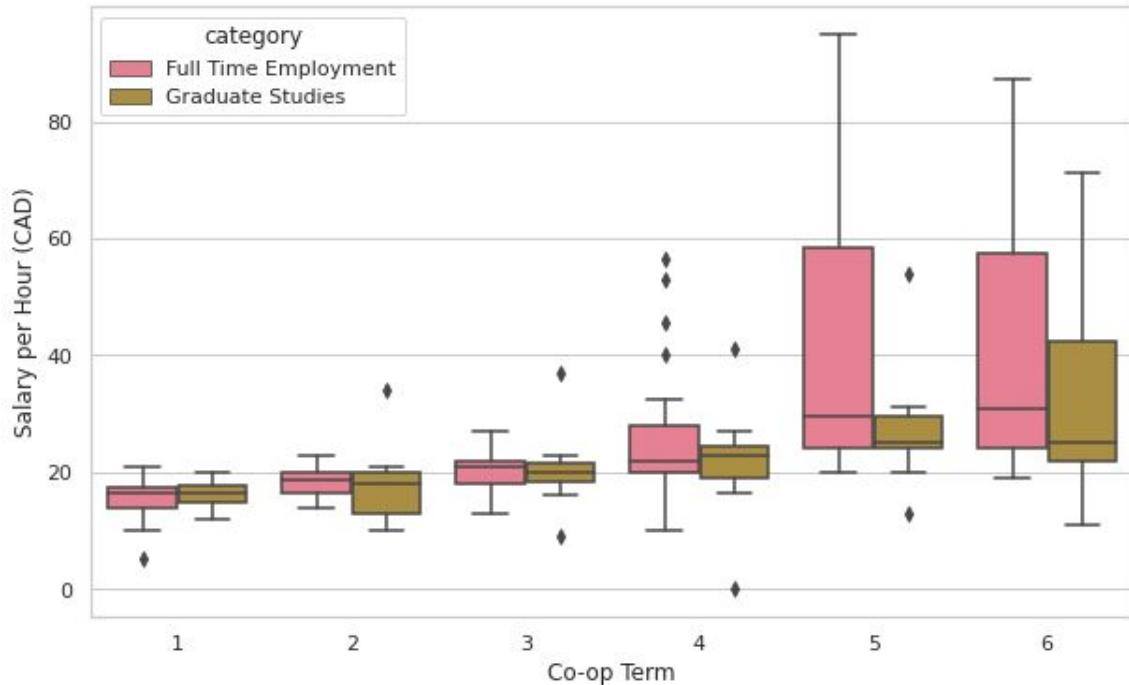
Did we experience a gender wage gap?

Previous class surveys in the department have found a wage gap associated with how fewer women went into the software field. But as our class had a fairly even split in gender across different roles, there appears to be no significant wage gap.



Did future plans affect how we chose co-ops?

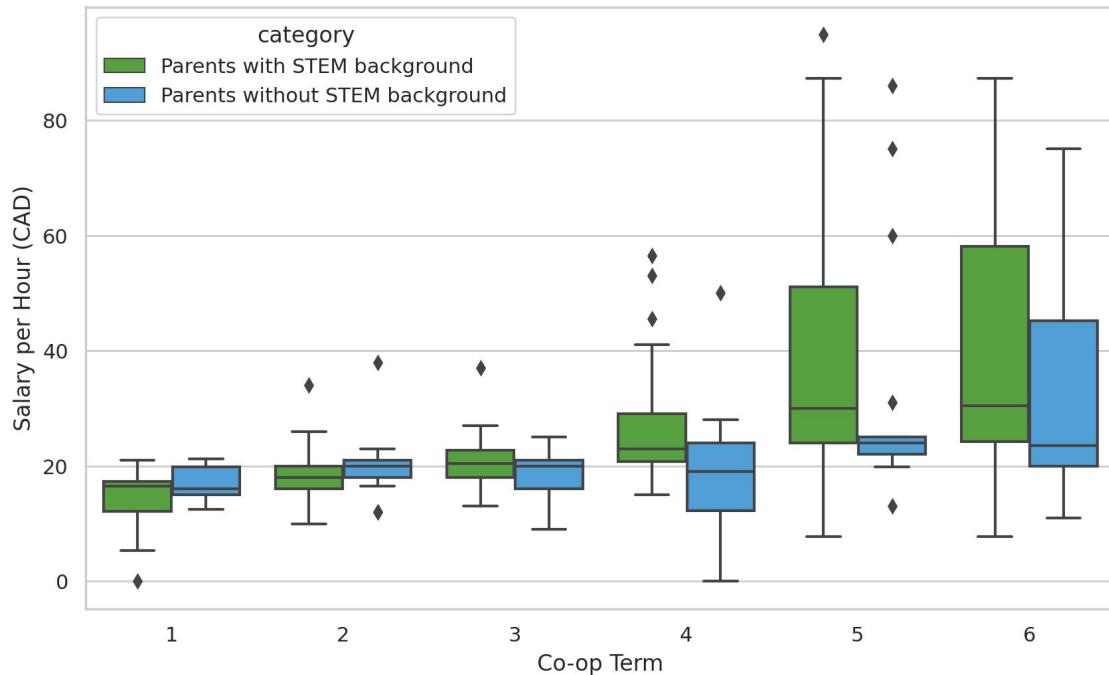
Those heading directly for full-time employment tend to see the last couple co-ops as important for potential full-time conversion, which could explain why the average salary only deviated in the last 2 terms.



Does our parents' education affect our salary?

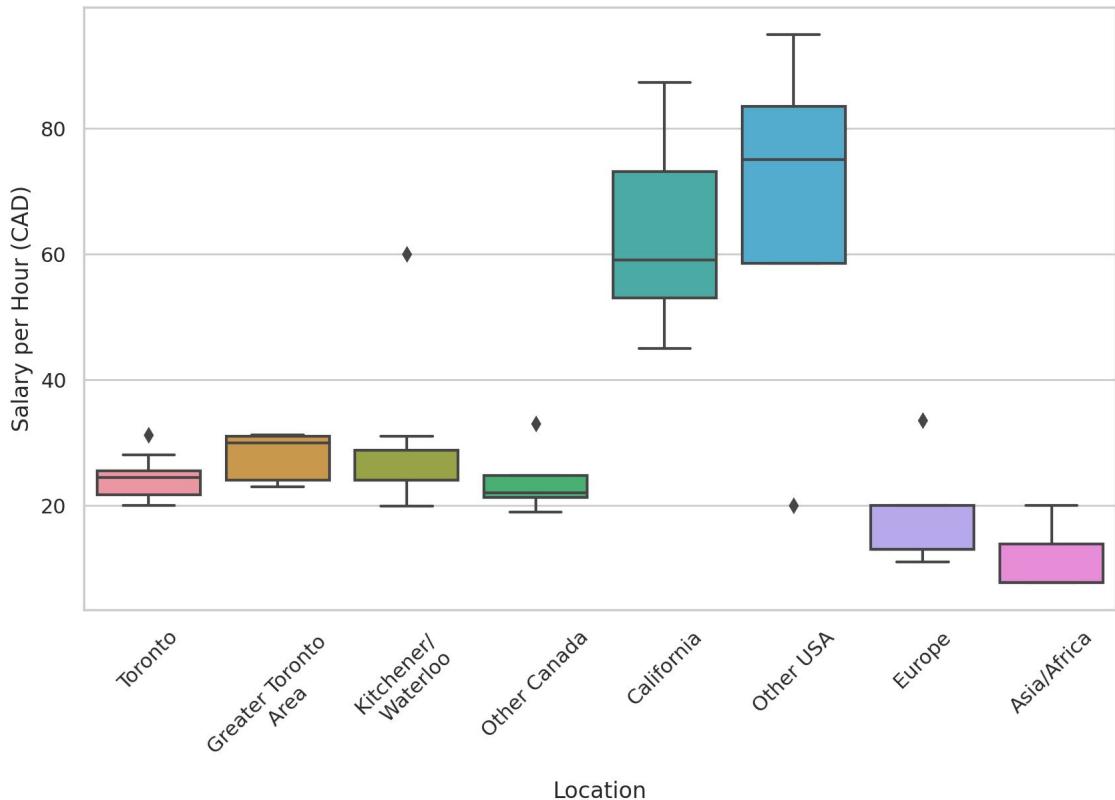
Does growing up around a parent/parents with STEM backgrounds influence how we make decisions or what connections we have available?

In parallel to this, it was found that salary had no relation to household income or parents' highest level of completed education.



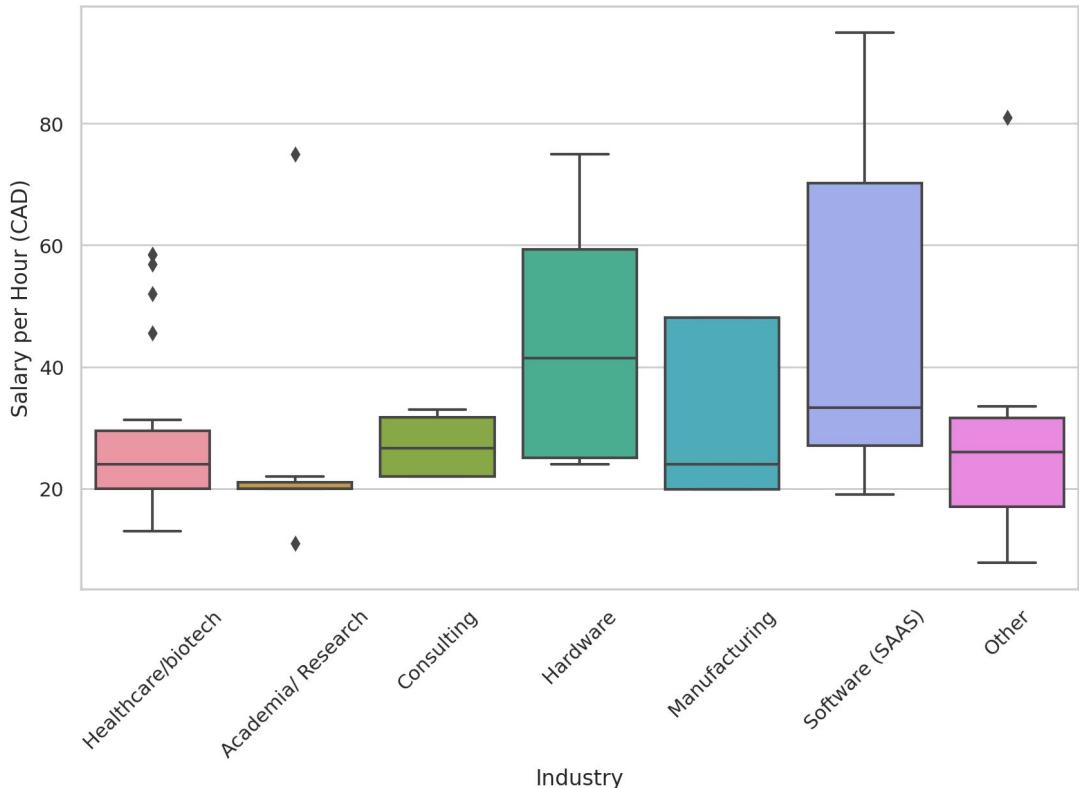
How much does salary differ across locations?

It is no surprise that the US pays big 🚗💰 for engineers.



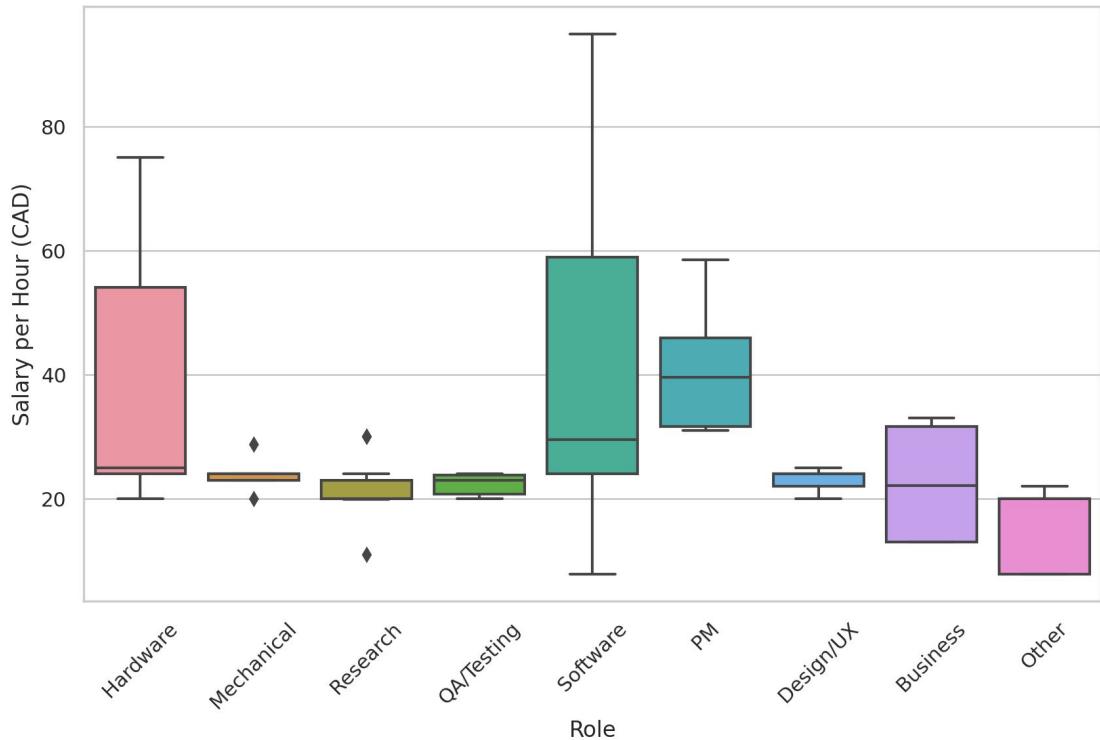
Do some industries pay more?

It appears that engineering salaries are highest within tech industries.



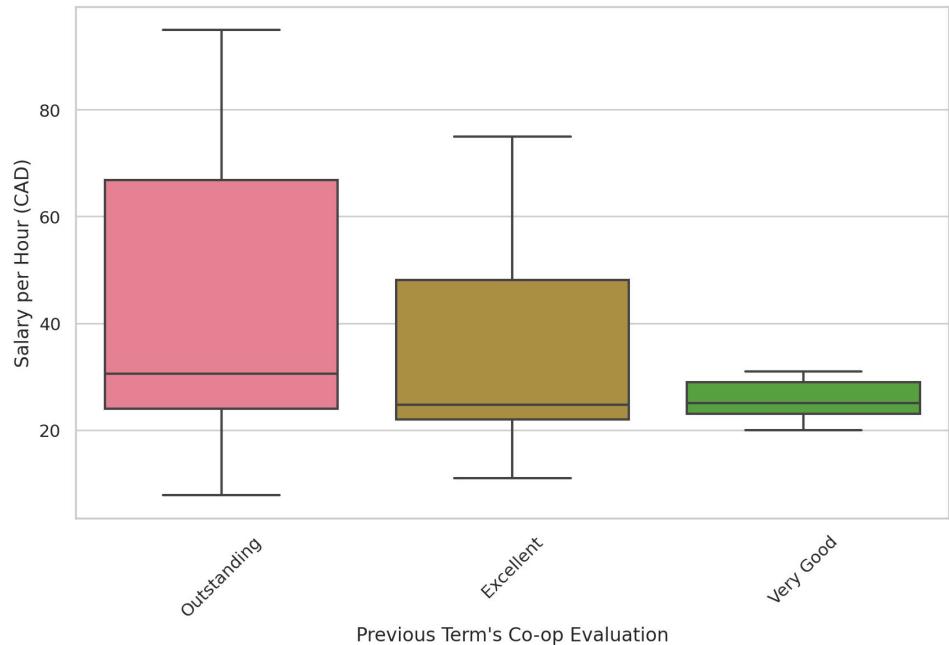
Do some positions pay more than others?

Project/Product management and software positions had a higher average salary.



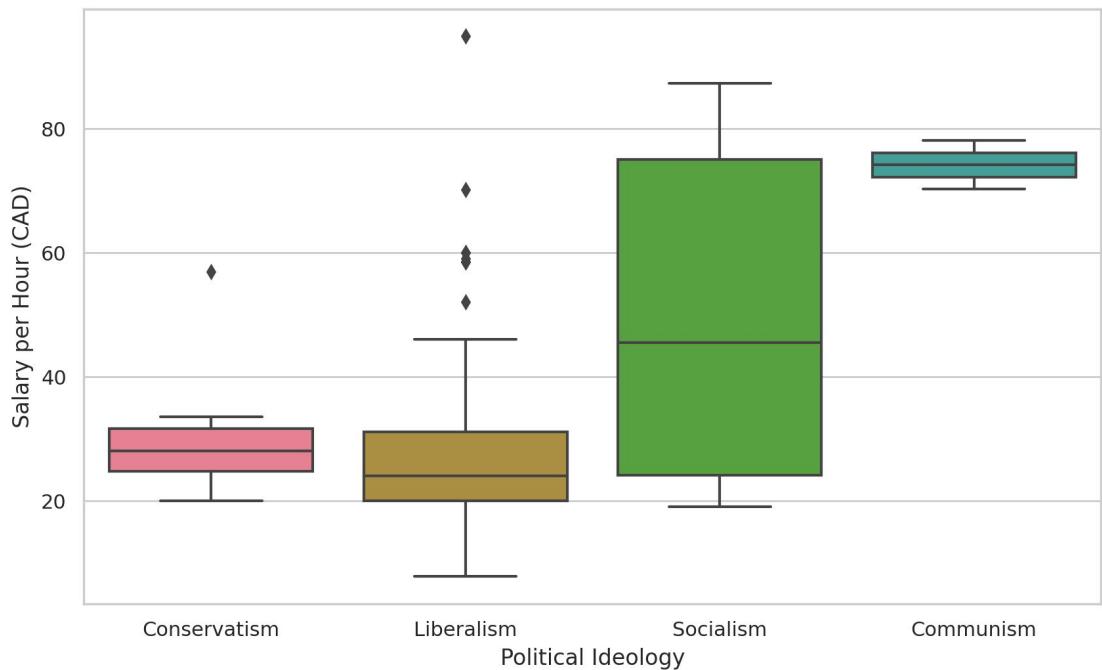
Does the previous co-op evaluation affect our next co-op?

Contrary to the belief that employers do not care about our rating past second year, students with higher salaries did tend to have higher ratings in their previous co-op.



Does political ideology influence salary?

Draw your own conclusions 😅



04

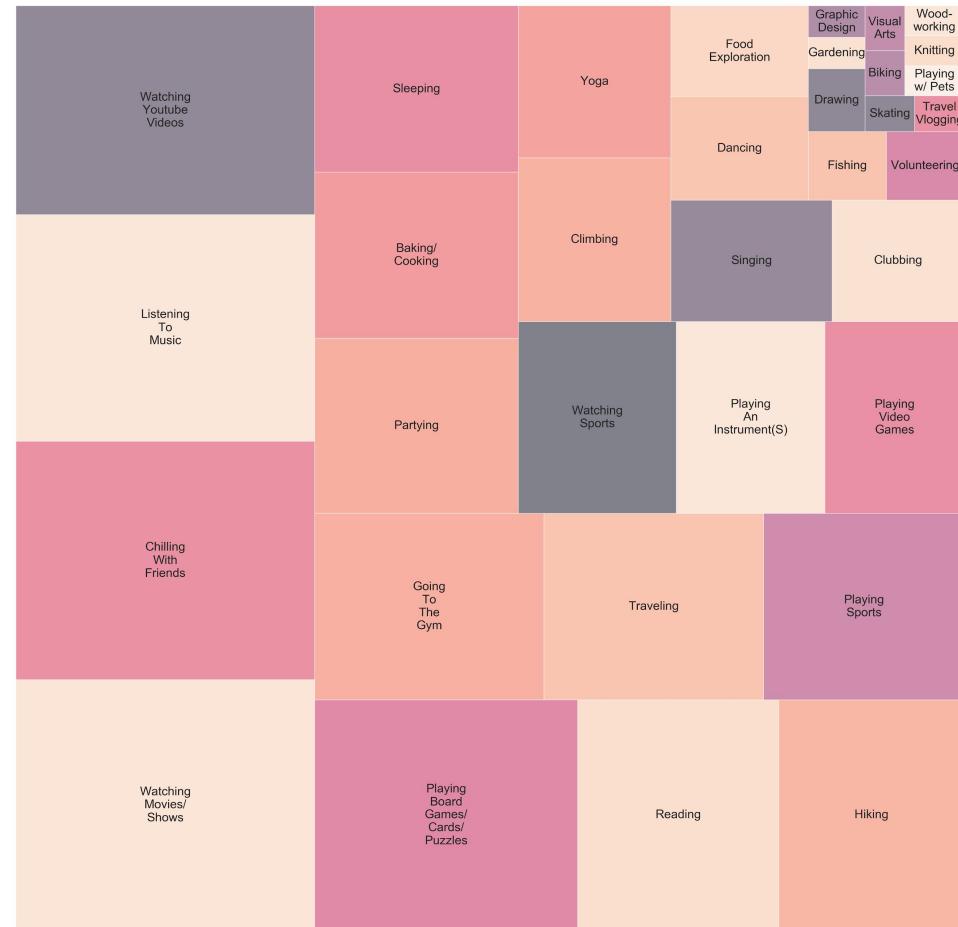
Social

Rec & Leisure, Lifestyle, Relationships, Mental Health

What do we do for fun?

Watching youtube videos, movies and TV shows, listening to music, and spending time with friends are the most popular activities amongst BMEs.

The question has to be asked, how much more popular would partying have been in first year? 😱



What clubs did we join?

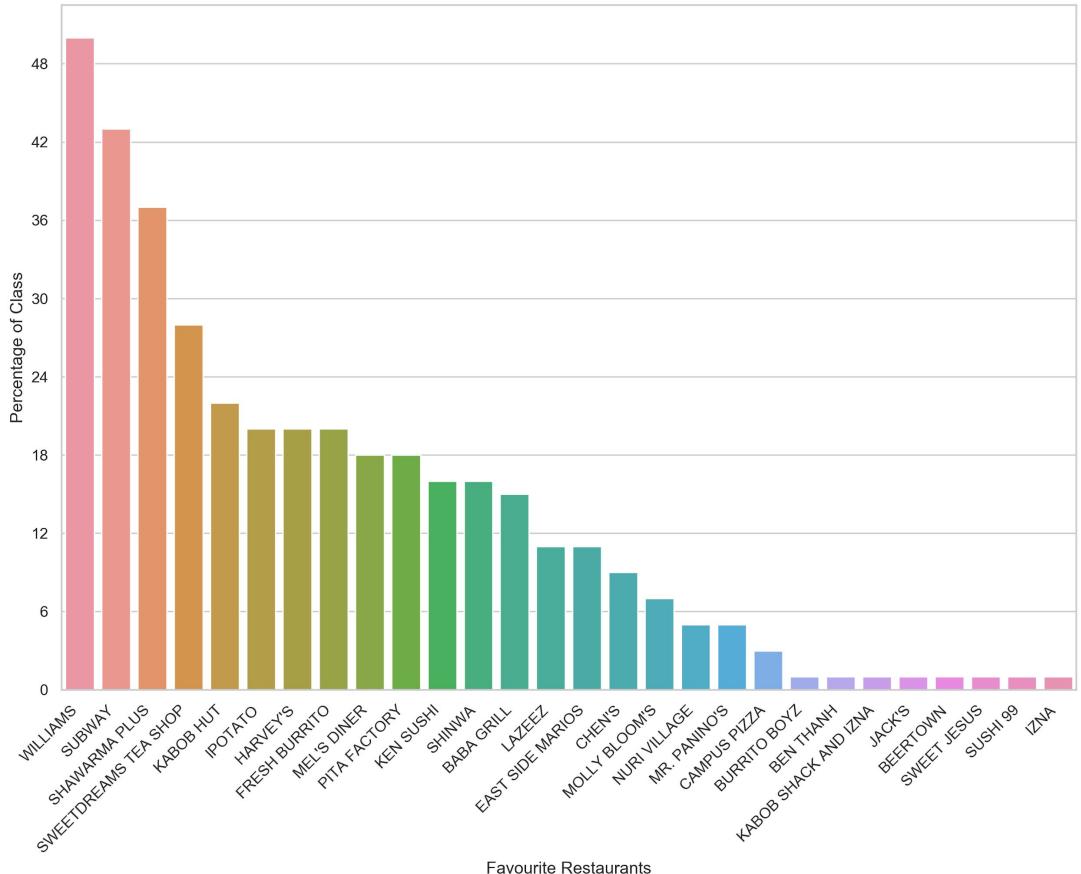
Most of us took part in Biomechatronics club or Intramurals. Some participated in BME Acapella 🎵

We never did see a single performance though...

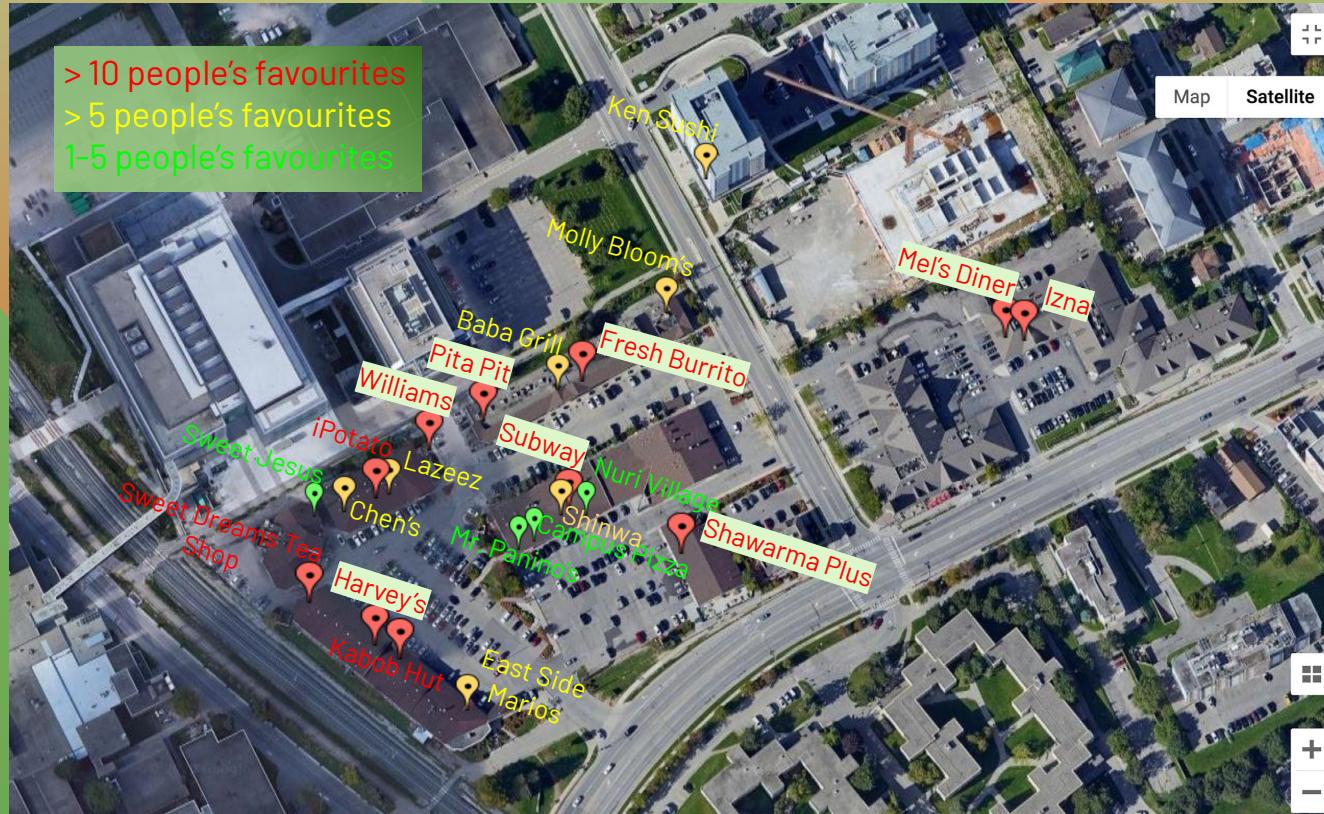


What restaurants did we frequent?

How does the saying go...? A Subway and William's coffee a day keeps the doctor away?



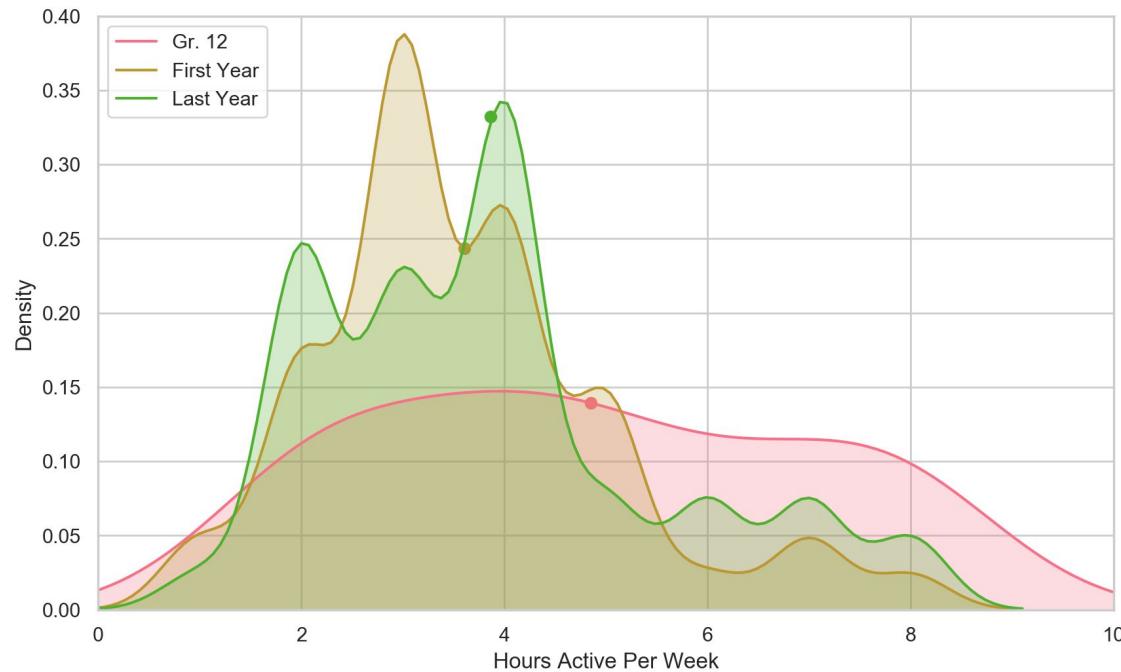
What restaurants did we frequent?



How physically active are we?

The spread of physically active hours in gr. 12 may be a result of more free time in high school.

However, it can be seen that the hours spent being physically active did increase by the time we reached our last year – maybe we did gain some time management skills after all!

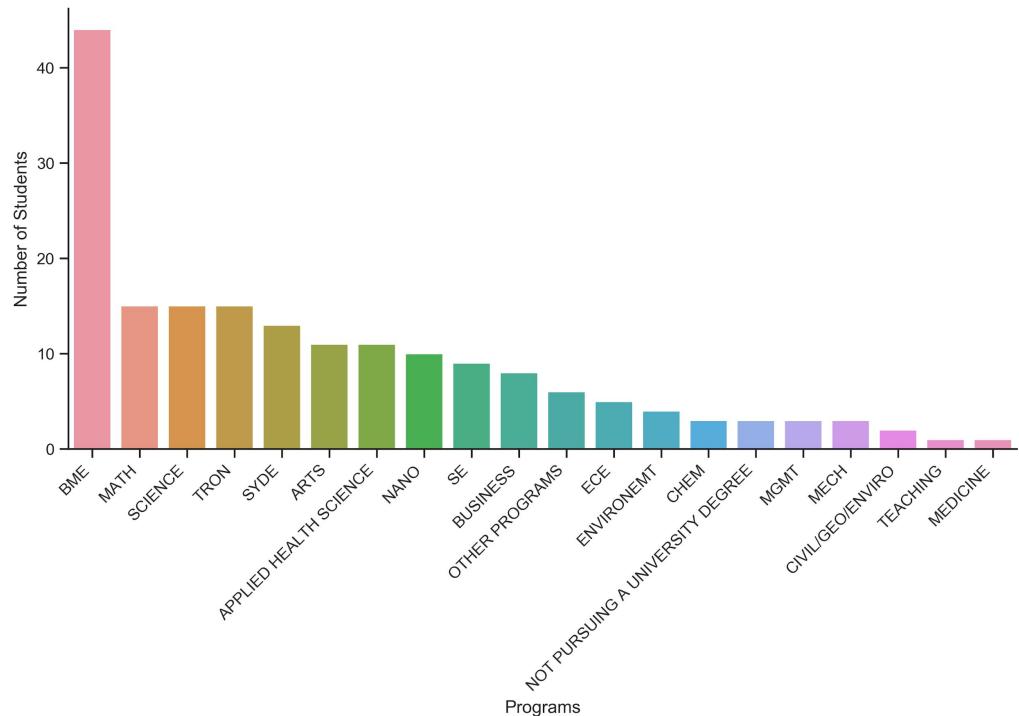


What programs were our friends in?

BME is definitely not a clique.

We have friends within our own program, other engineering programs, other faculties, and friends outside of university as well.

Our friendships are as diverse as our courses!

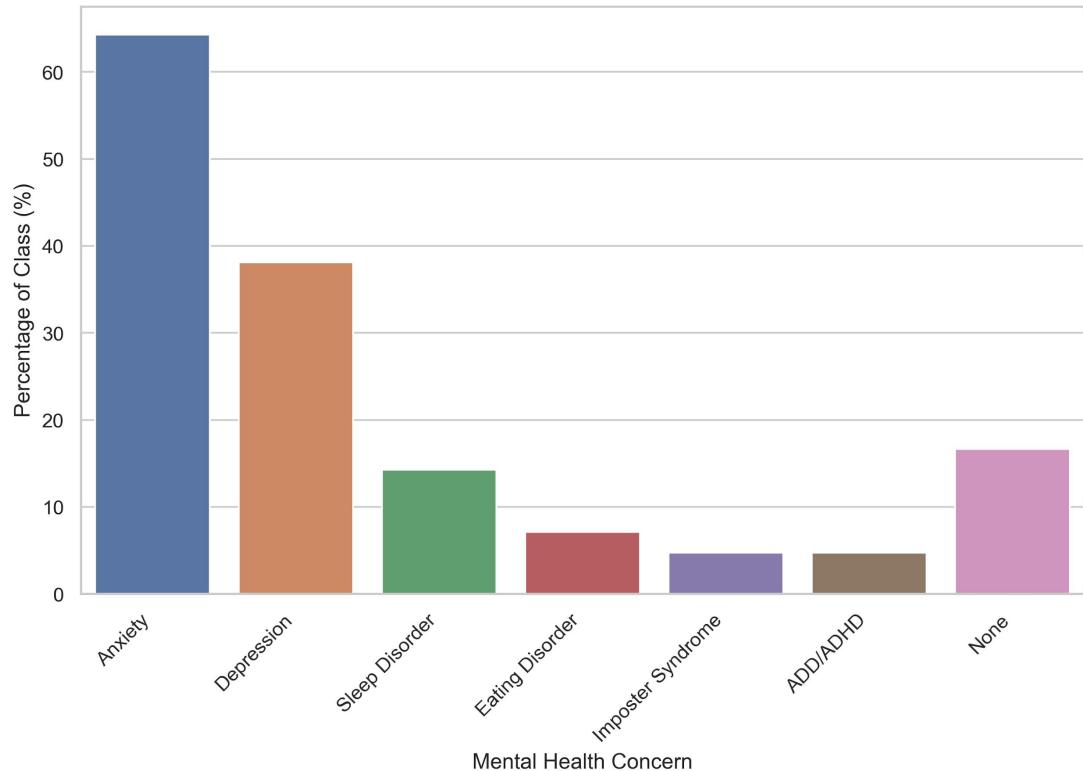


Mental health

The transition to university is often a difficult time for students as they need to adopt to a new environment, new peers, and possibly new learning styles.

64% of respondents self-reported as having struggled with Anxiety.

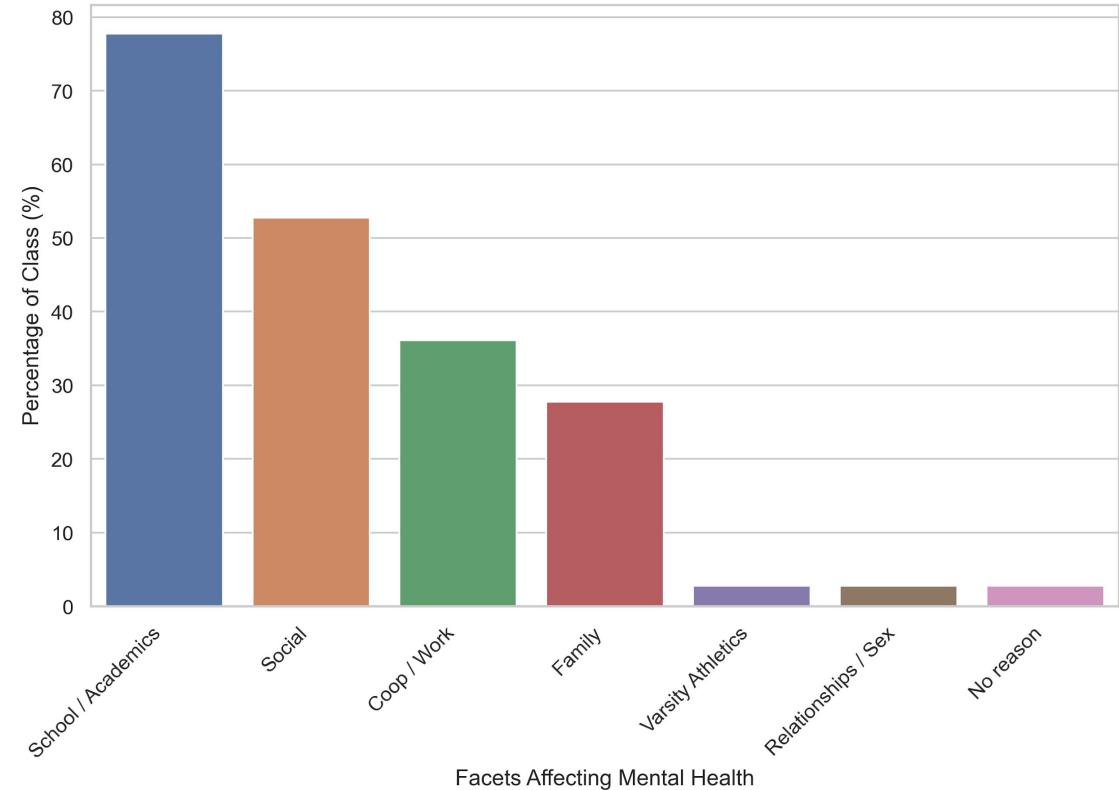
16% of respondents self-reported as not having experienced any mental health concerns.



Facets affecting mental health

Academics seemed to have the most impact on mental health, at **78%**.

Just over **half** the class attributed impact on mental health to their social life, **36%** attributed it to co-op and work, and **28%** attributed it to family.

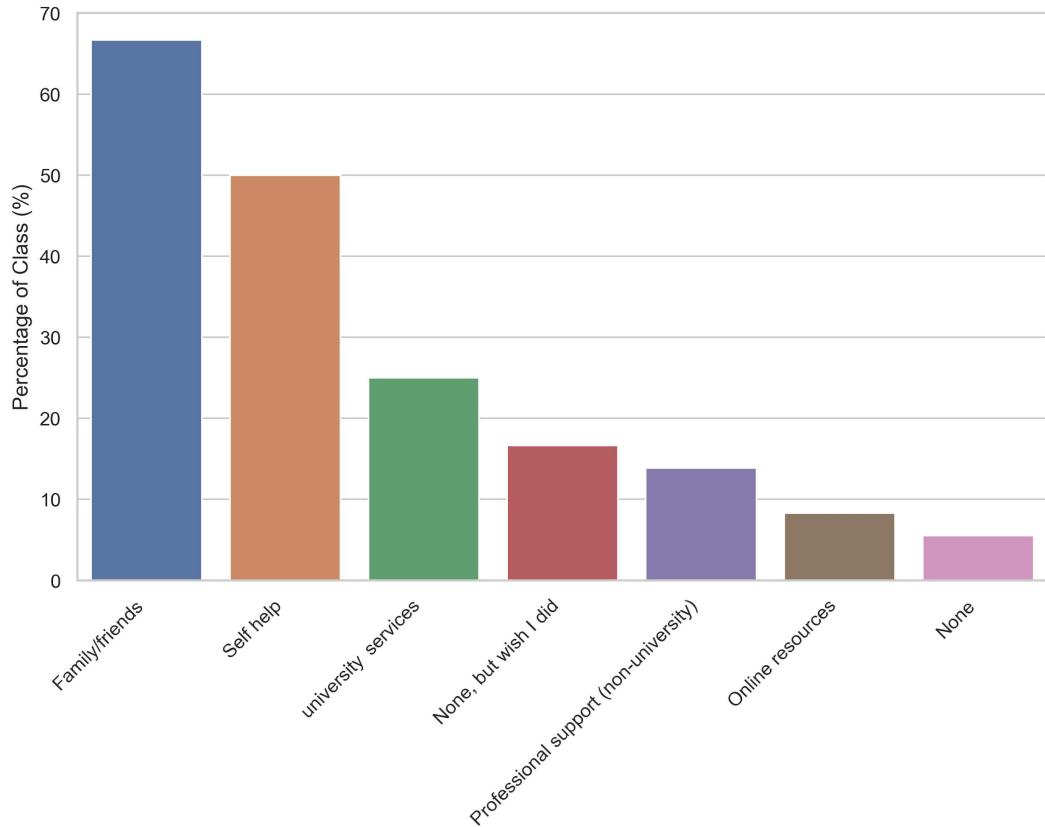


Mental health resources

67% of respondents reached out to family and friends for support.

Half of the respondents utilized self-help.

39% obtained professional support.



05

Persona

Learnings, Self-Perception, Myers Briggs, Zodiac

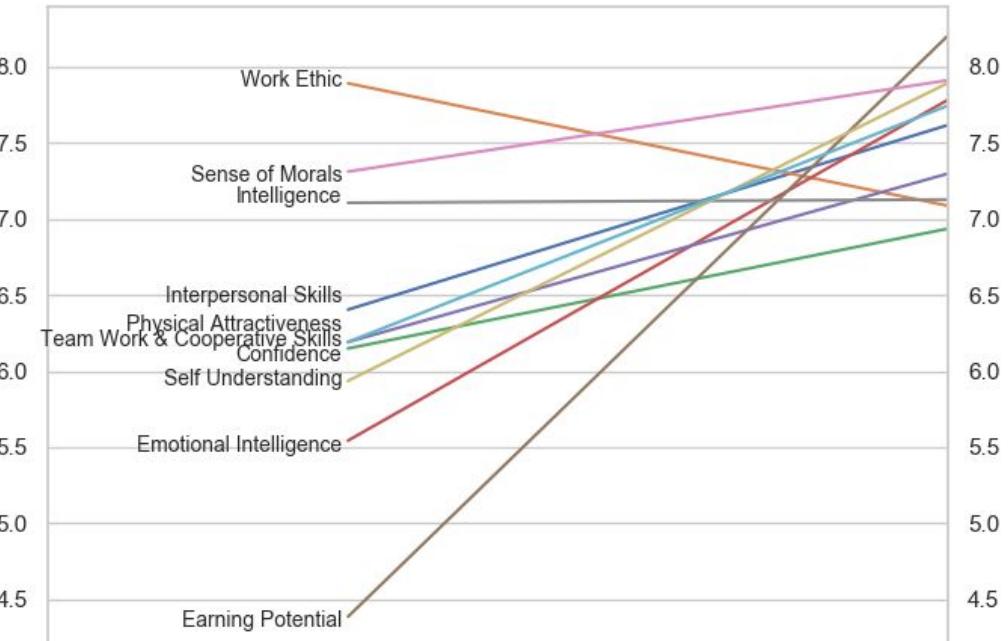
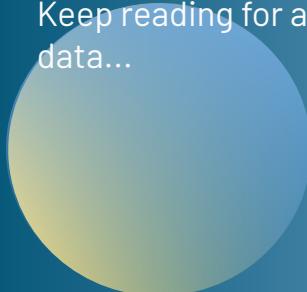
What did you learn about yourself that surprised you?

<p>“That I am capable of handling a lot of stress and pressure”</p> <p>“That I can do anything I put my mind to”</p>	<p>“I really like intense workout classes”</p> <p>“I’m very resilient”</p>	<p>“I realized I’m not as great as I thought, but I’m okay with that”</p>	<p>“I do not have a great work ethic”</p>
<p>“I am incapable of managing my own laziness/lethargy to force myself to do basically anything until it becomes critically necessary”</p>	<p>“The fact that I thought I knew what my sexual orientation was, but actually I still don’t”</p>	<p>“How easily I affect my own emotions and doubt myself for no reason”</p>	<p>“Working hard isn’t necessarily correlated to happiness or success”</p>

How have self-perceptions generally changed since entering the program?

Overall, we believe that our academics improved. However, university education transcends lectures and coursework, and our matured level of self-awareness exemplifies that.

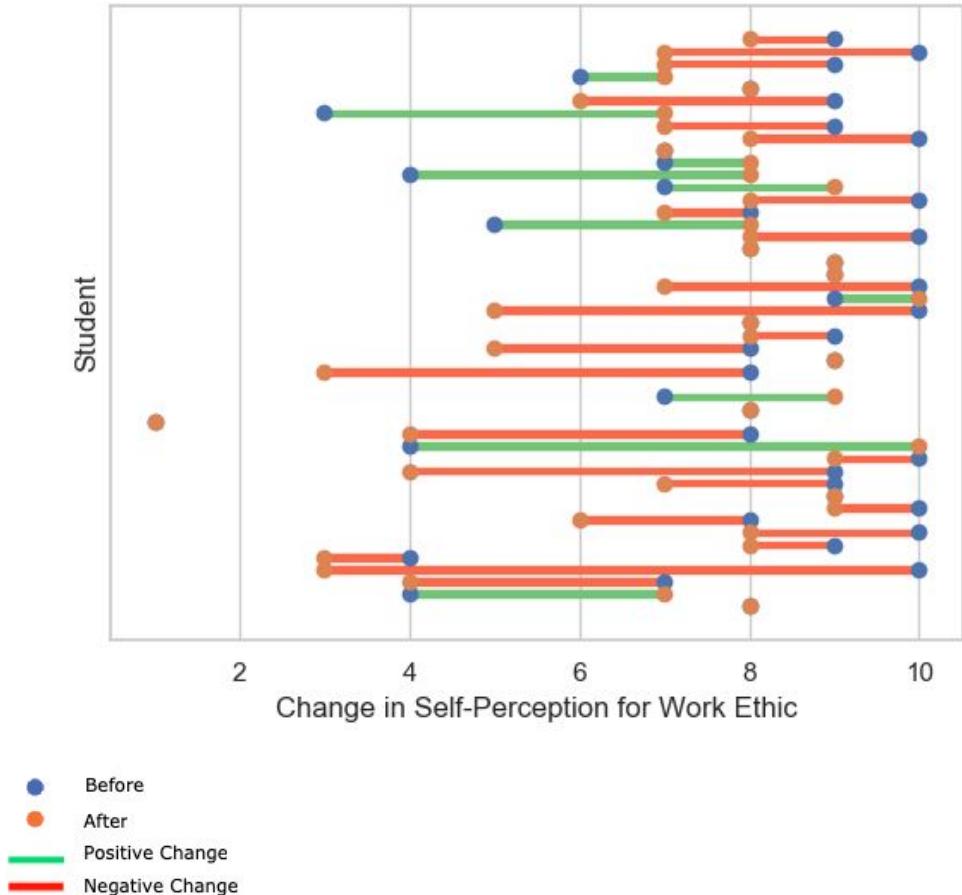
Keep reading for a closer view of the data...



How have self-perceptions of *Work Ethic* changed since entering the program?

This is the only trait that a majority of the class believed declined after completing university 😢

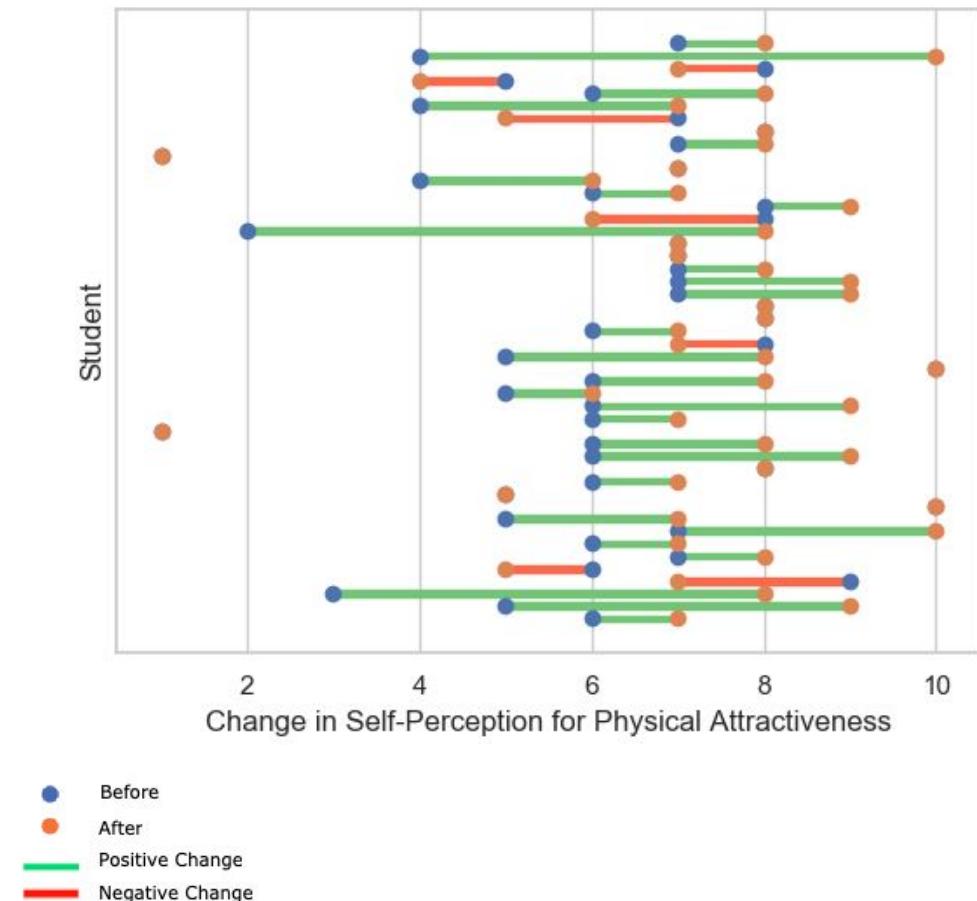
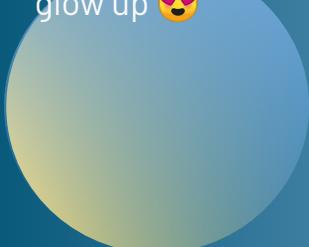
We generally feel that we were more hard-working before entering BME.



How have self-perceptions of *Physical Attractiveness* changed since entering the program?

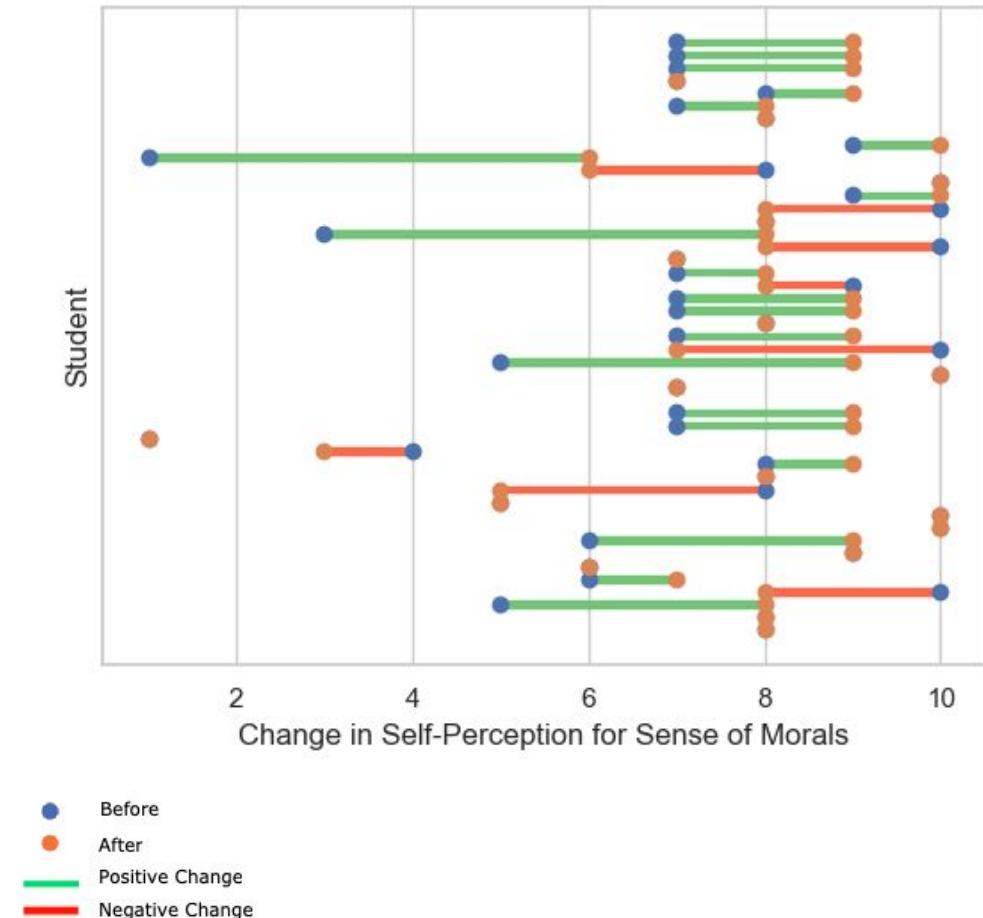
We generally feel that we've become more physically attractive since entering BME.

The stats don't lie - BME makes you glow up 🌟



How have self-perceptions of **Morals** changed since entering the program?

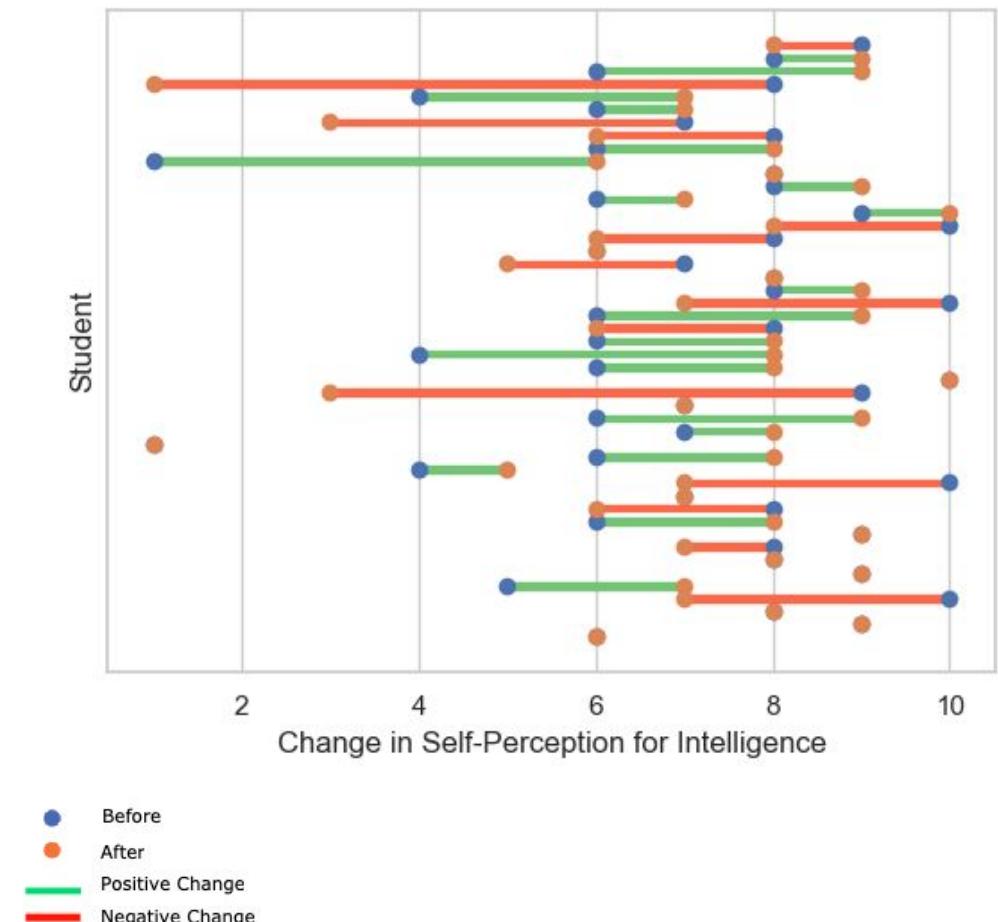
More than 17% of the class admitted their sense of morals degraded over the course of BME. Our ethics professor would not be impressed.



How have self-perceptions of *Intelligence* changed since entering the program?

Interesting to note how our self-perceived intelligence stayed the same. The more you know, the more you know you don't know. You know?

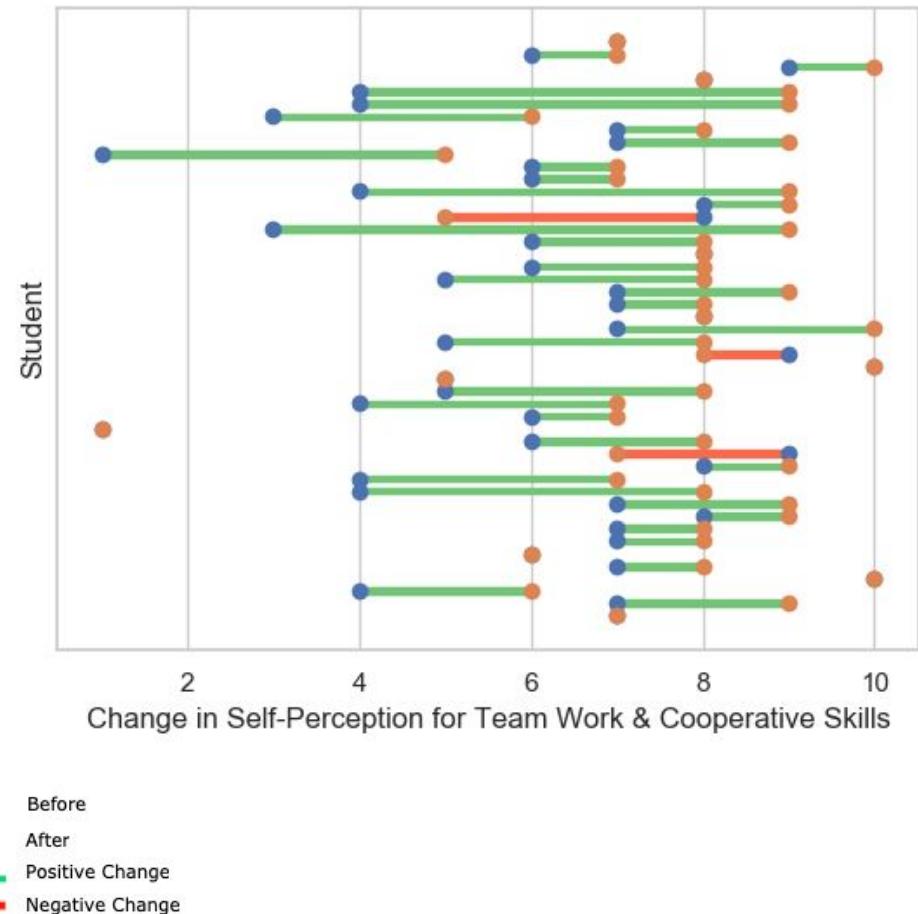
14 students felt that their intelligence decreased since starting BME.



How have self-perceptions of **Teamwork** changed since entering the program?

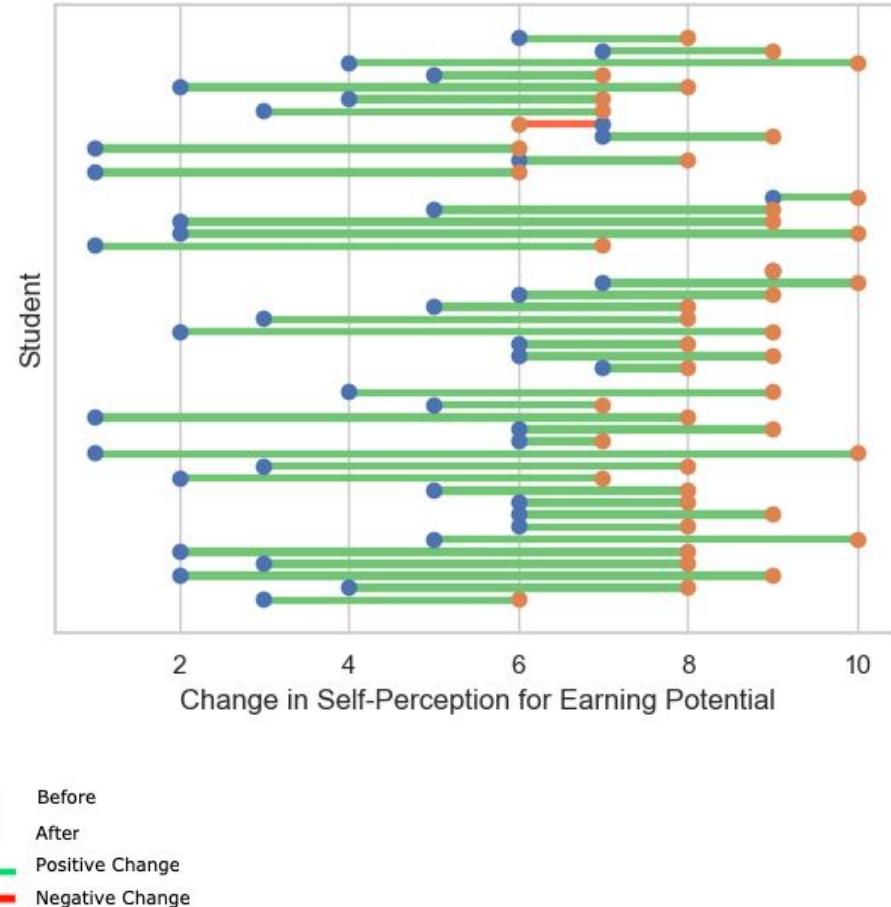
We generally feel that our teamwork skills have improved since entering BME.

You would think so after that many group projects...



How have self-perceptions of *Earning Potential* changed since entering the program?

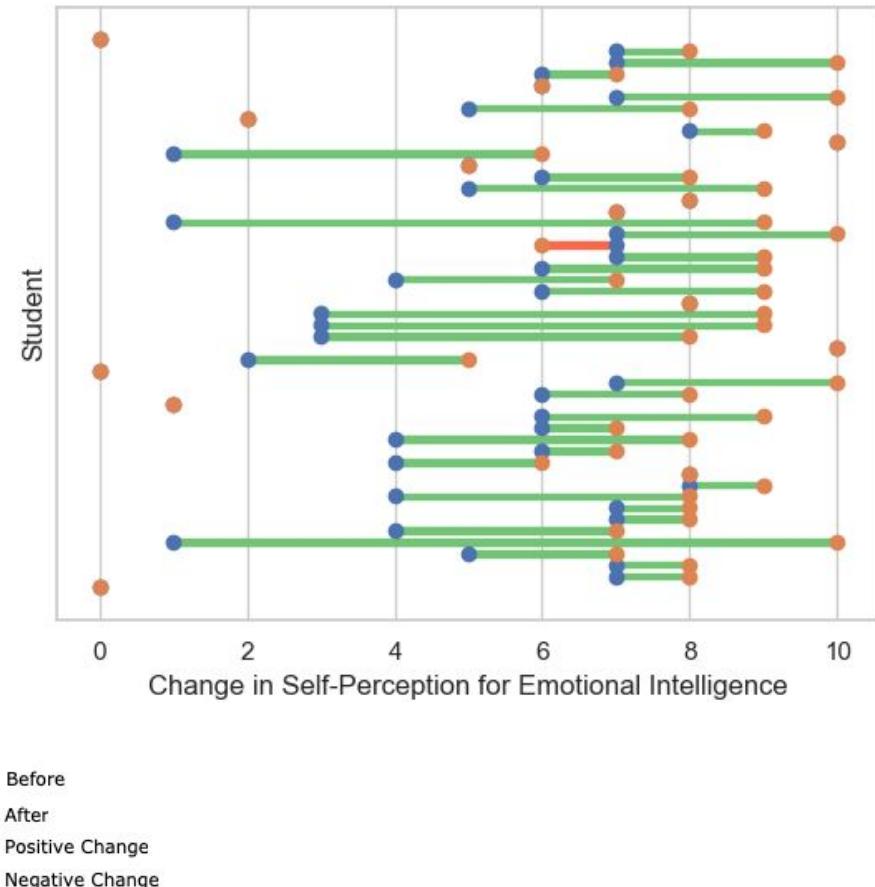
So it looks like our tuition will repay itself after all...



How have self-perceptions of *Emotional Intelligence* changed since entering the program?

Most BMEs reported that they believe their emotional intelligence increased.

Undergrad is just as much about personal growth as it is career growth.

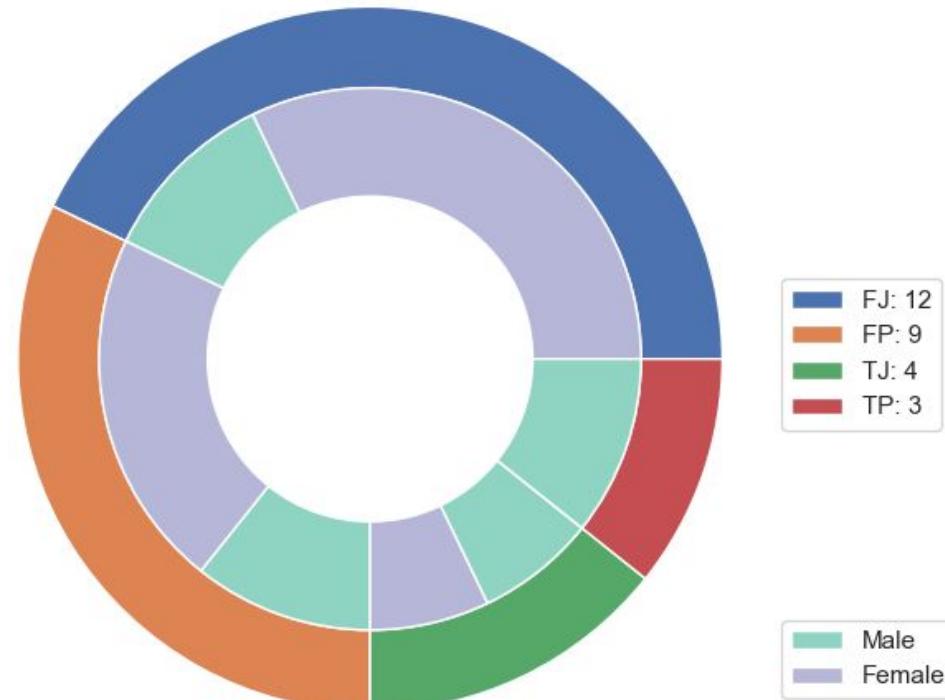


Which Myers-Briggs personality types are prominent in our class?

Comparing the second half of Myers-Briggs traits (ex. Introverted Observant Feeling Prospecting), the respondents' natures were dominated by feeling (F) more so than thinking (T), which deviates from the perception of a typical engineer's mindset.

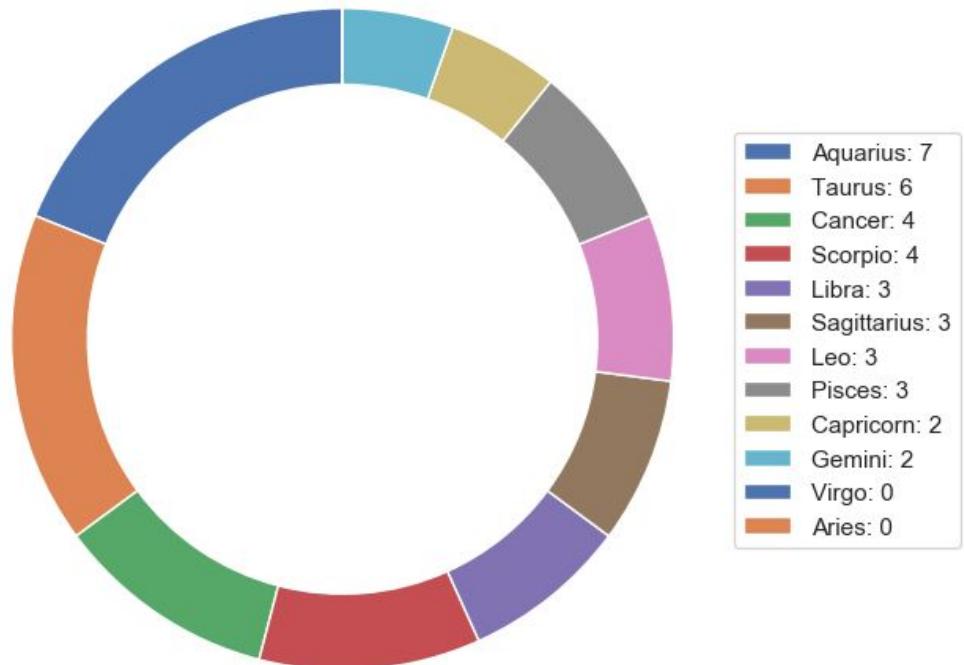
The respondents' tactics were dominated by judging (J) more so than perception (P).

60% of the respondents had an introverted personality type.



What are our zodiac signs?

BME was written in our stars ✨✨



06



Our Future

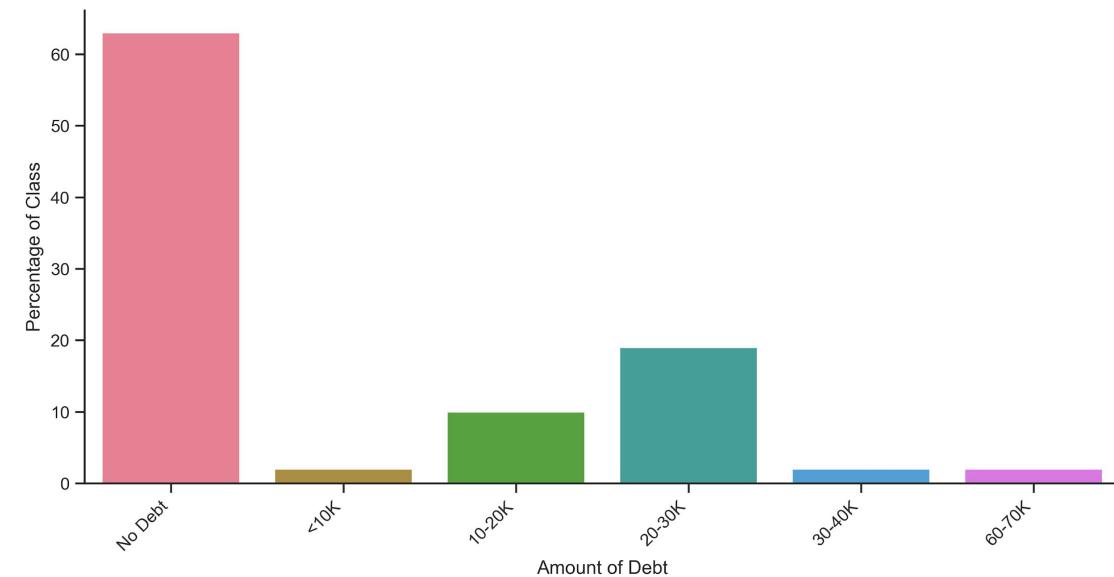
Debt, Grad Trip, Future Endeavours, Grad School, Career, Beyond BME

How much debt are we graduating with?

Over **60%** of the class has graduated without debt.

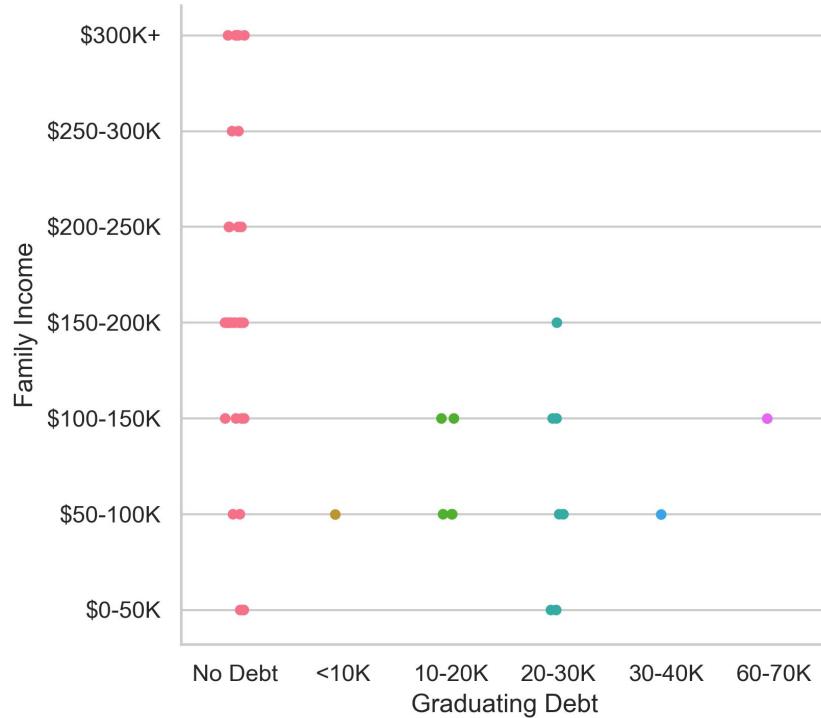
The largest demographic effect on debt was where students came from. On average, Ontario students had **\$6,900** of debt, out of province had **\$20,000**, and international **\$12,500**.

On average, BMEs are graduating with **\$9,000** in debt. The average Canadian undergraduate student graduates with **\$26,000** in debt. It's possible the difference can be attributed to money earned from co-op.



How does our graduating debt compare to our family income?

All students who graduated with debt had a family income lower than **\$200,000**. However, students graduating with no debt came from a wide range of household incomes.

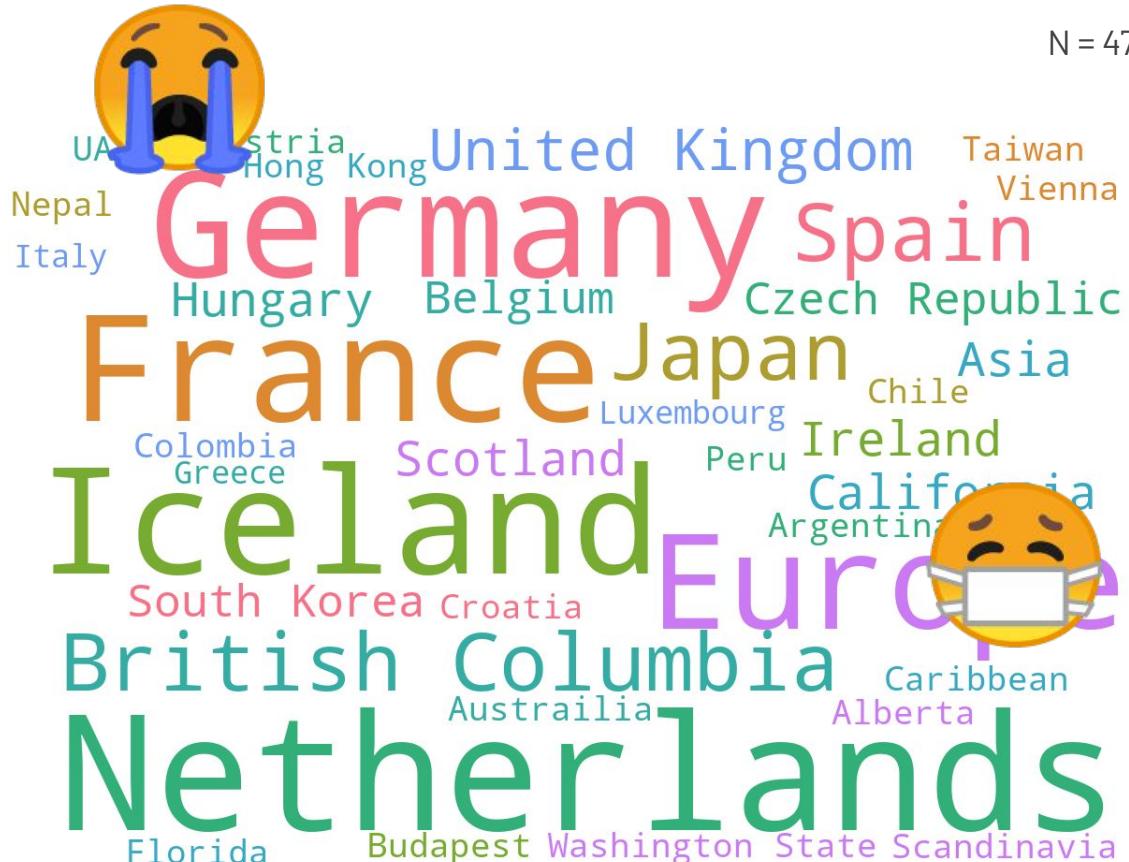


Grad Trip Plans ...pre COVID19

80% of the class was considering going on grad trips prior to COVID19.

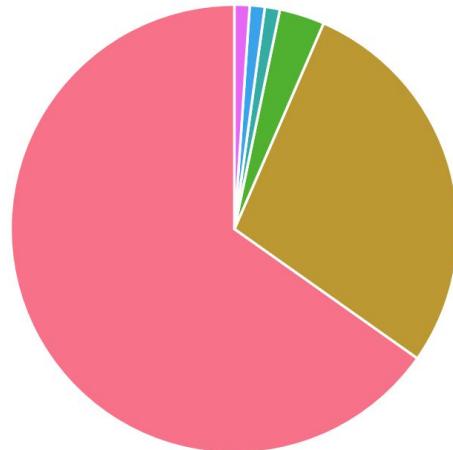
15% intended to travel solo, while 30% intended to travel in a pair.

94% planned to travel for at least two weeks.



What are we planning on doing immediately after graduation?

30% of the class is pursuing further education, which is high compared to other programs.

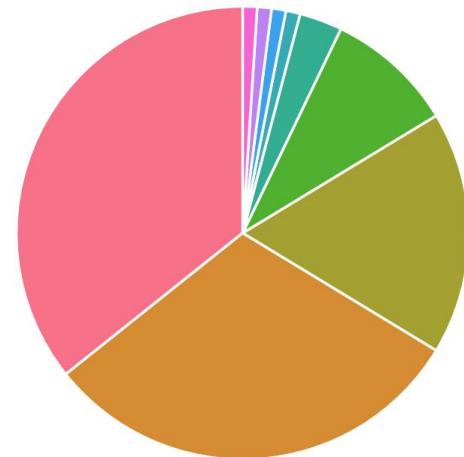


Full Time Employment:	60%
Graduate Studies:	26%
Medical School:	3%
Startup:	1%
Another Undergraduate Program:	1%
Taking It Easy:	1%

What do we expect ourselves doing down the road?

Eventually, the class does want to try different things.

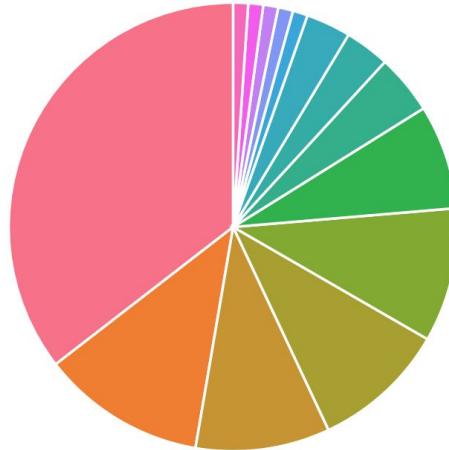
17% of class wants to pursue entrepreneurship, 9% want to brave med school, and a total of 36% of the class eventually wants to pursue some form of further studies.



Full Time Employment:	35%
Graduate Studies:	30%
Startup:	17%
Medical School:	9%
Another Undergraduate Program:	3%
MBA:	1%
Law School:	1%
Master of Fine Arts:	1%
No Idea:	1%

Are any of us considering career changes?

66% of the class is considering a career change to different fields, varying from finance to theater!



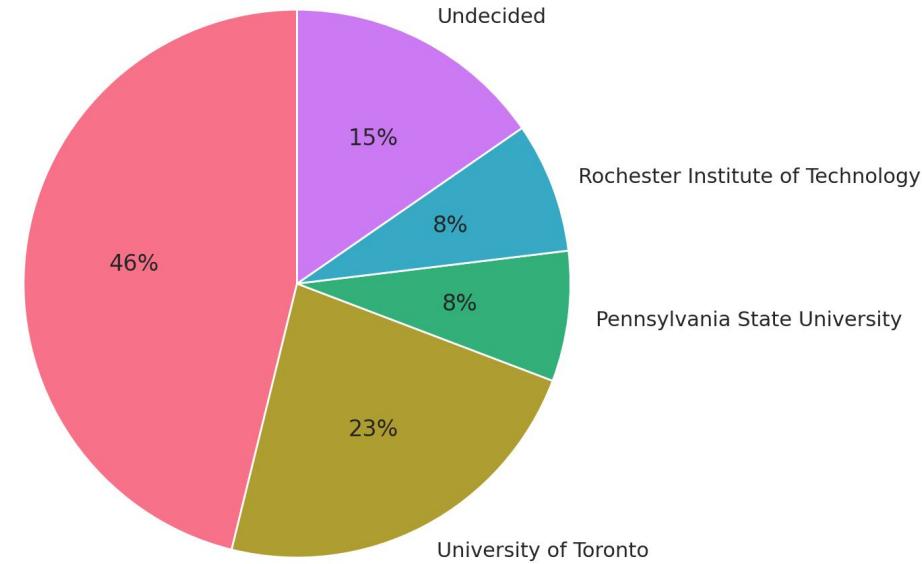
No: 33%
Project Management: 11%
Medicine: 9%
Product Design: 9%
Business: 9%
Academia: 7%
Education: 4%
Law: 3%
Theater: 3%
Machine Learning Researcher: 1%
Not Sure: 1%
Development: 1%
Art: 1%
Finance: 1%

What graduate schools are we going into?

11 students will be pursuing a Masters degree, while **2** will be pursuing a PhD.

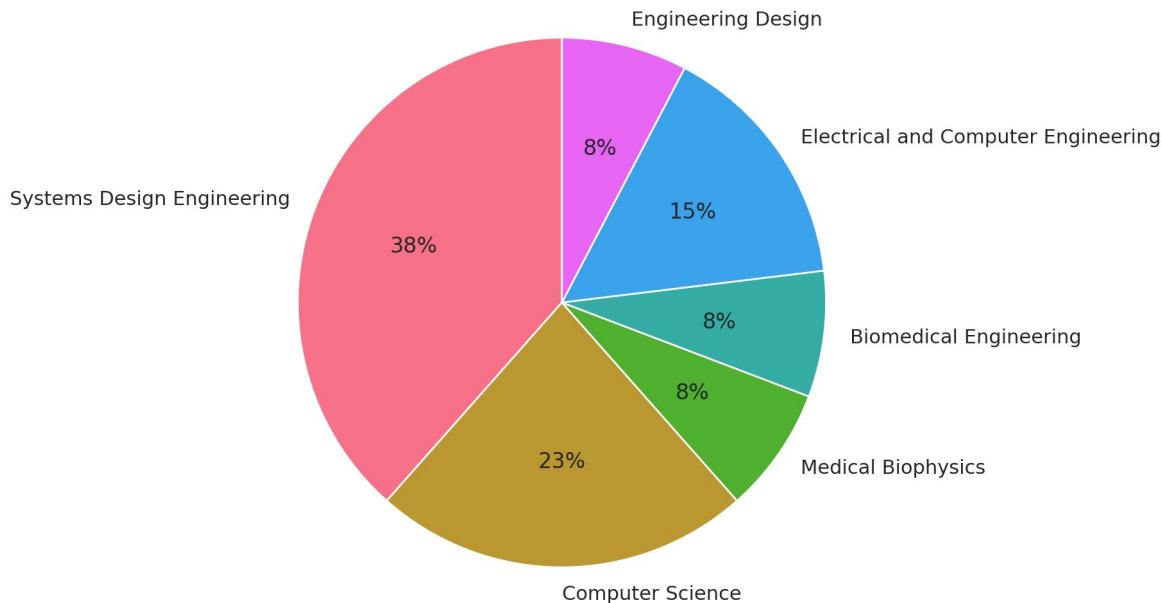
11 students are pursuing a research based degree, while **2** will be doing a course based Masters.

University of Waterloo



What graduate programs are we taking?

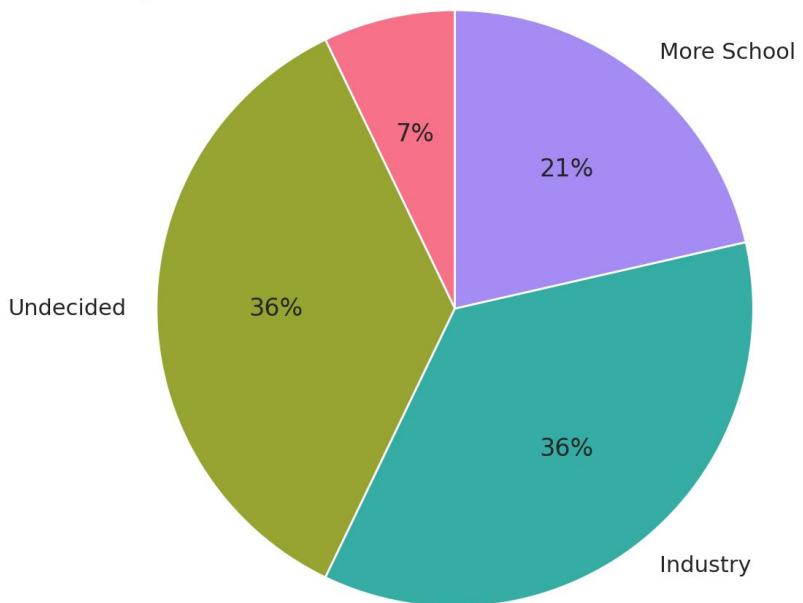
69% of those going into grad school will be within an engineering faculty.



What is the plan after grad school?

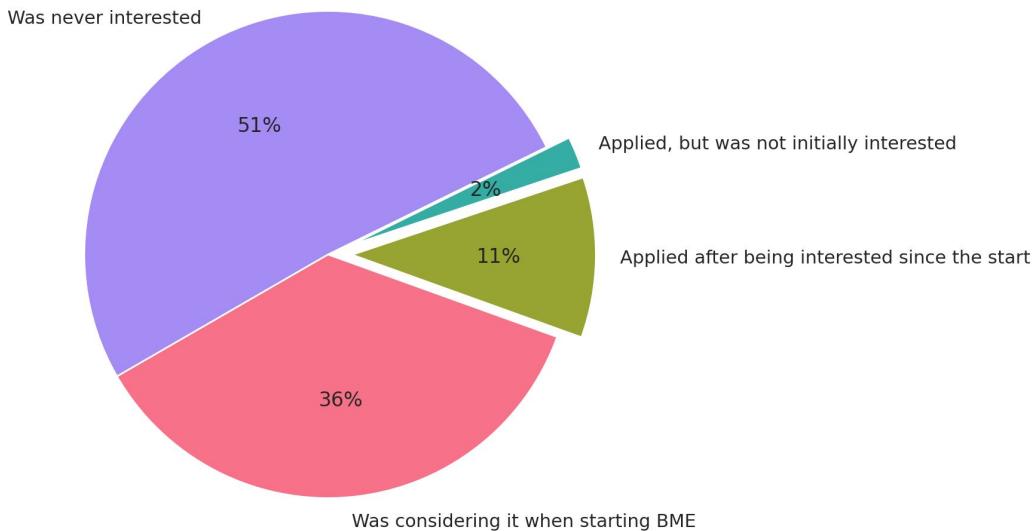
BME has a reputation for being a very academic field, and this is further reinforced by the number of research co-ops. It is interesting to note that our class will only yield one Academic.

Becoming an Academic (ex PI)



Did our class have an interest in applying to medical school?

47% of the class was considering applying to medical school when they started BME, but after completing the program, only **13%** are interested.

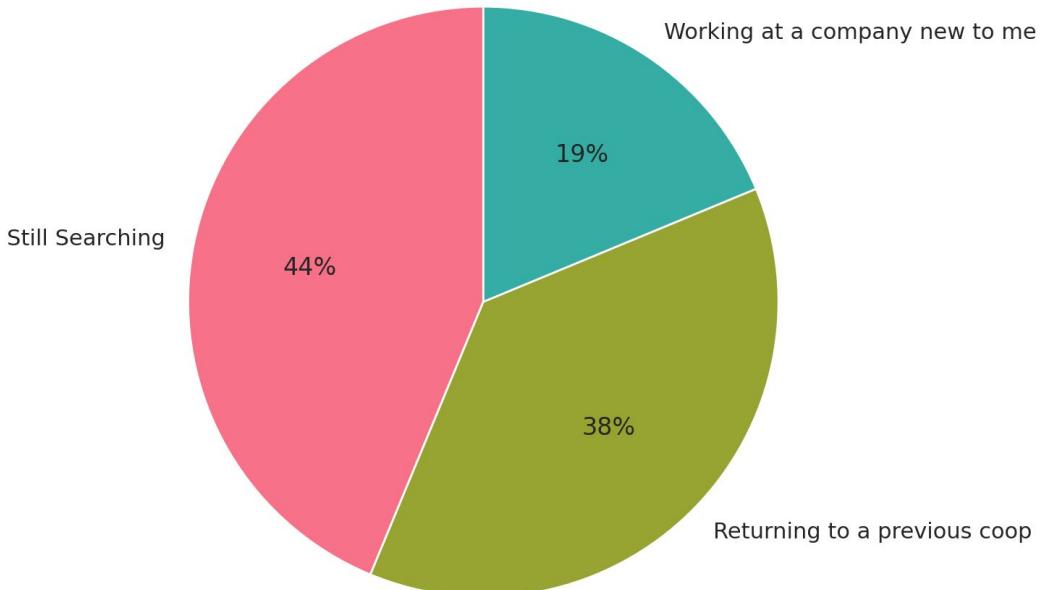


For those going into full-time employment...how's the job search?

33% of students are working within biotech.

Healthtech companies: Doximity,
MedAvail, TDK, Grand Rounds,
League, Public Health Agency of
Canada.

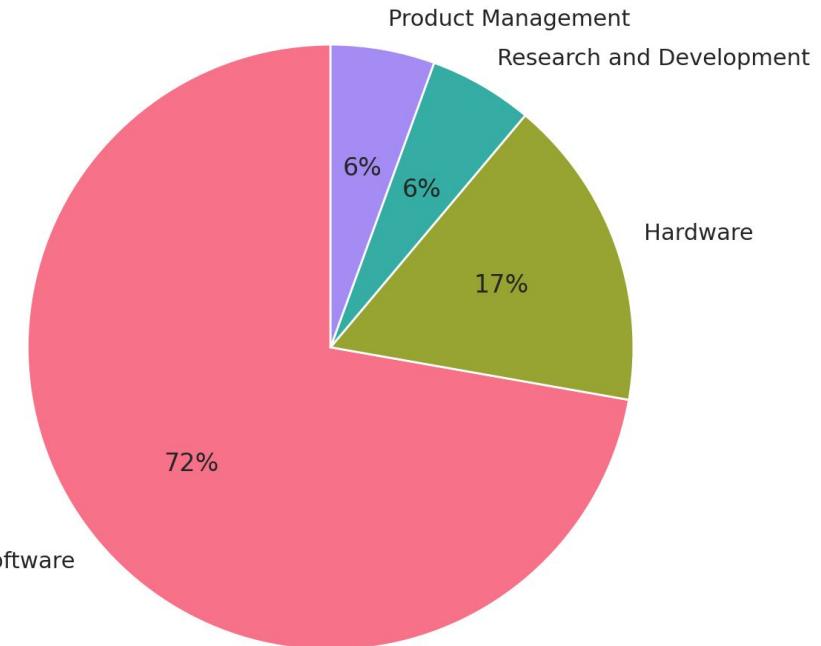
Other: IBM, Apple, Microsoft,
Facebook, Branch Metrics, Splunk,
iWave.



What full-time roles will we be doing?

94% of the class will be working within a realm they have interned within before, taking advantage of being able to test run a position during co-op before committing to it.

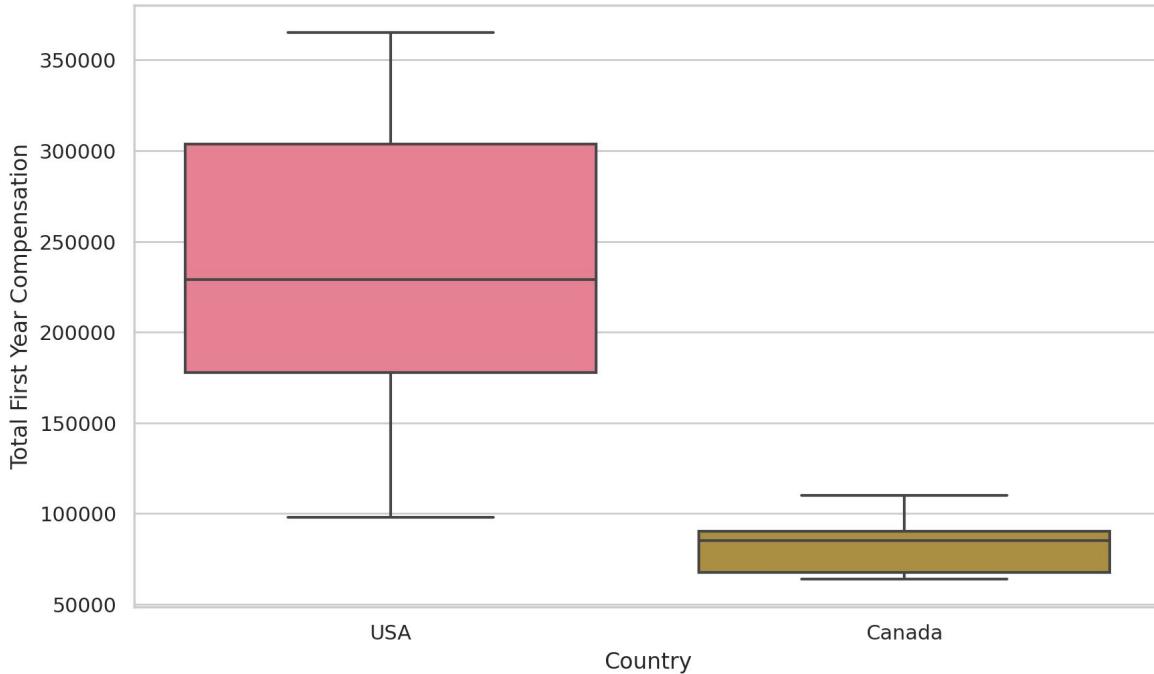
Even though we only had two mandatory software courses, 72% of the class chose to go into the field.



What is the distribution of full-time (CAD) compensation?

The large compensation gap is likely the cause of the “brain drain” within engineering, with many students choosing to leave the country.

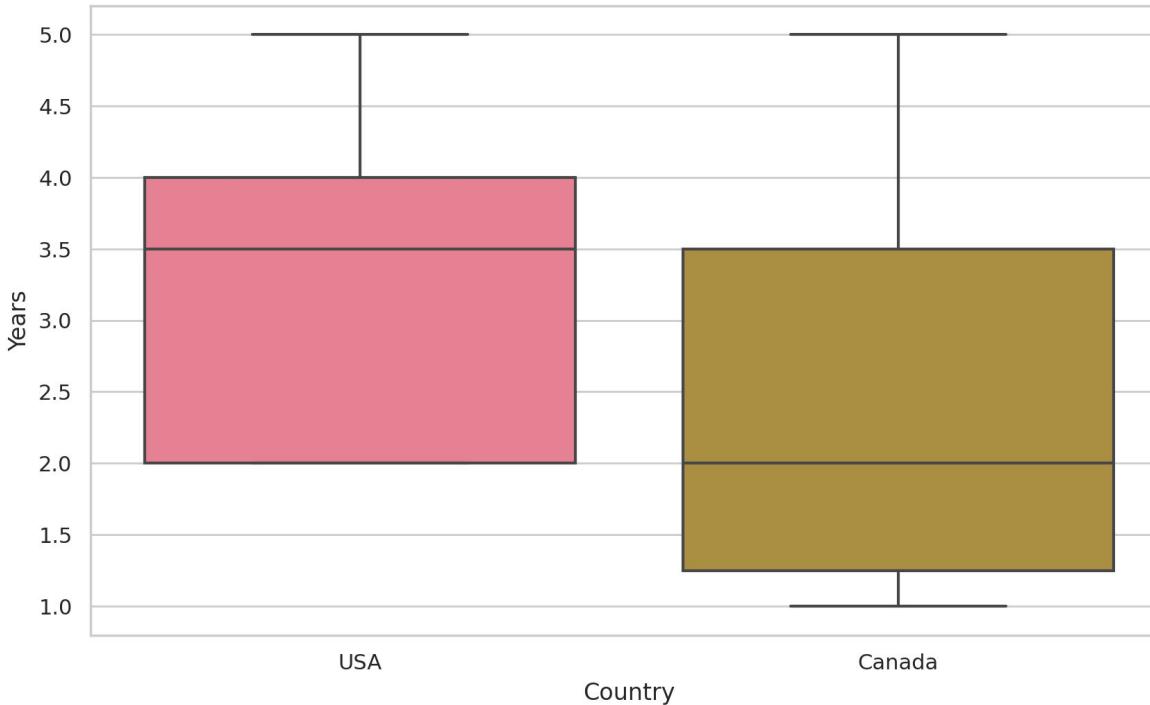
The large gap could also be a result of US companies often providing signing bonuses, which were included in the calculation.



For how many years do we plan to stay at our first company?

One potential reason why US retention duration almost doubles that of Canadian companies is their tendency to give stocks that vest for four years.

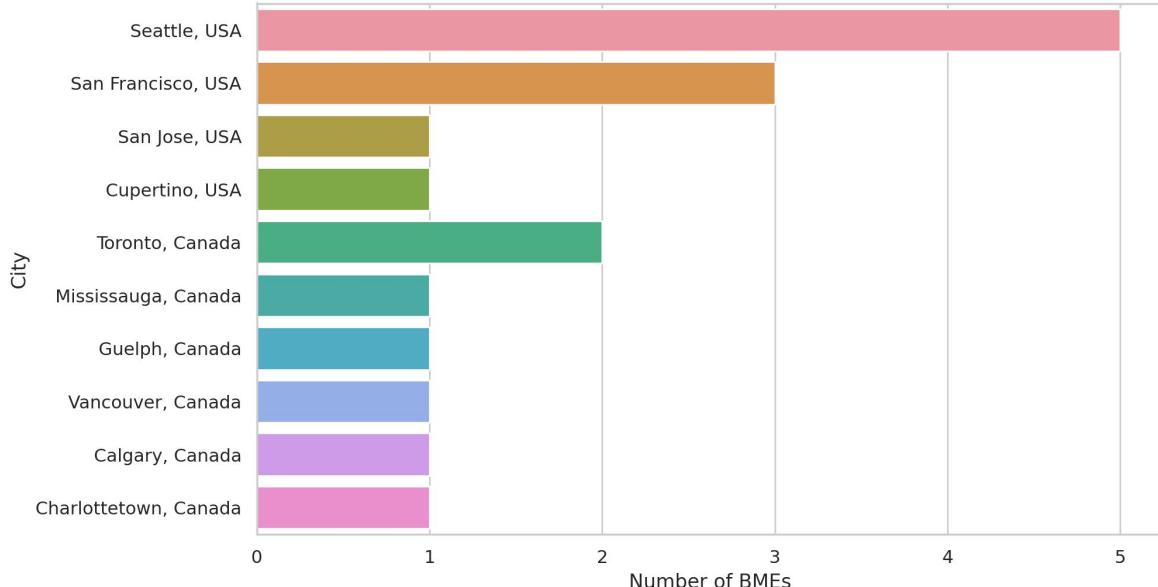
The most anybody expects to stay at one company is just **5** years; perhaps because the engineering market feels very flexible now.



Where are BME new grads working?

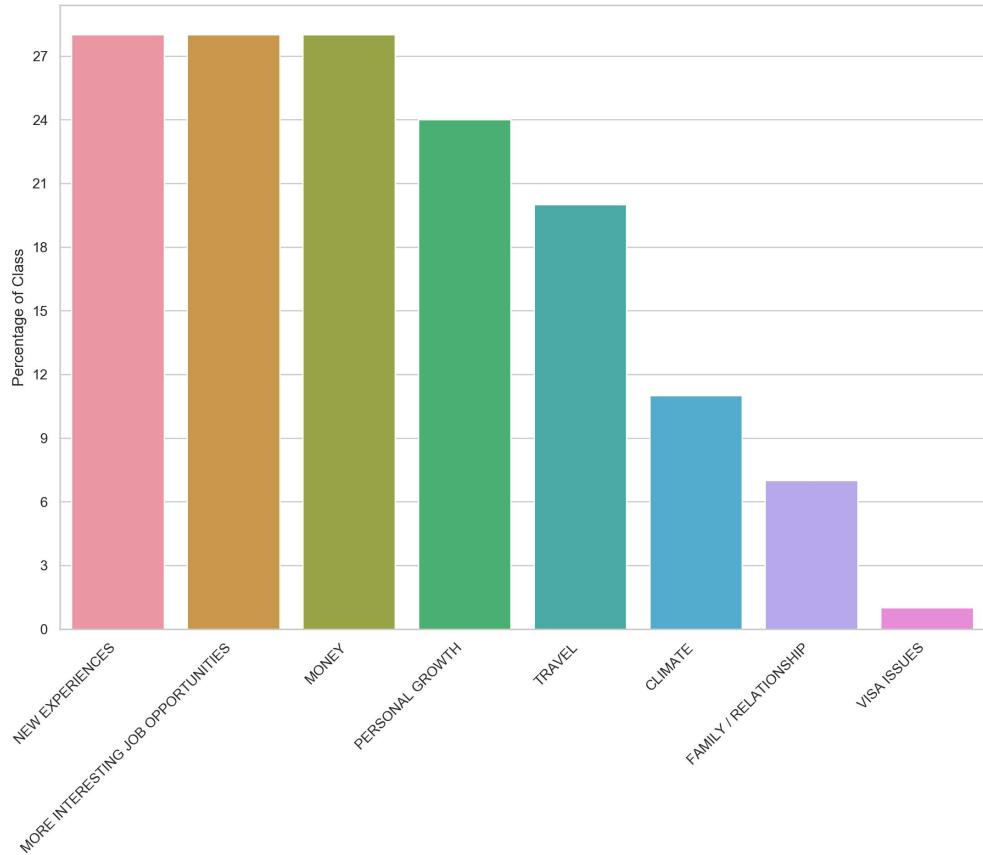
Only **18%** will be working within an hour commute from the home they lived in before university, showing that most students will likely be relocating away from home.

71% are working in a city they have had a co-op in.



If we're moving out of Canada, why?

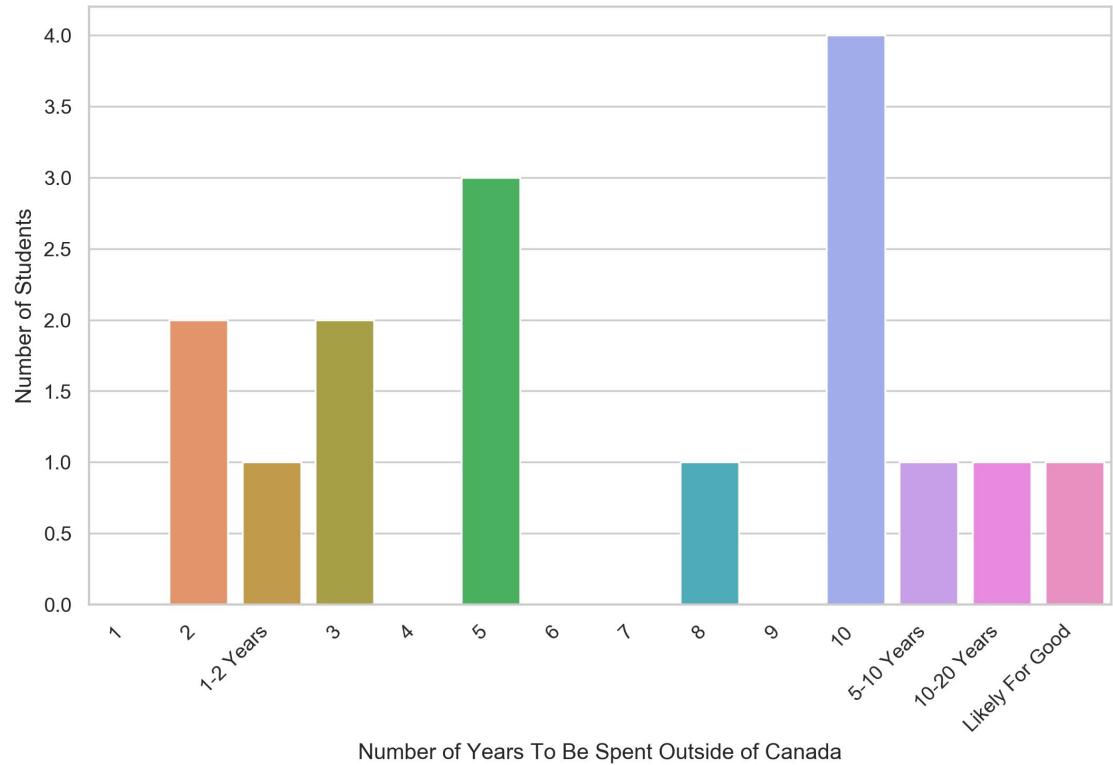
More than a quarter of the class wants to leave Canada for career and monetary purposes, as well as for new life experiences.



Reasons For Leaving Canada

If we're moving out of Canada, how long are we planning to stay out of the country?

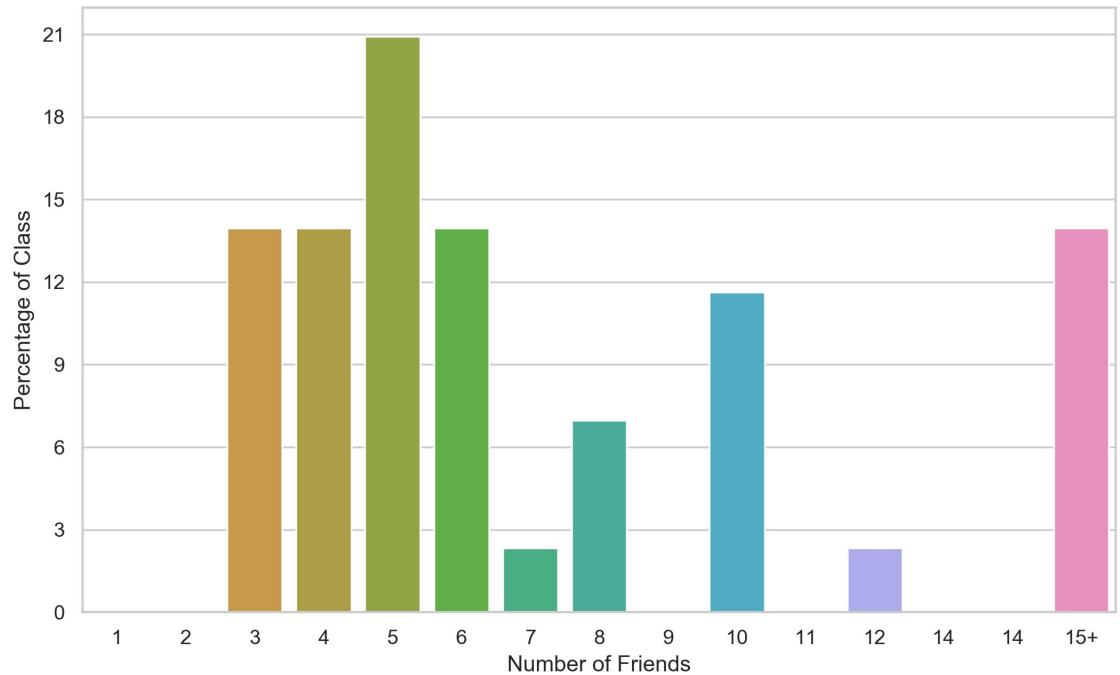
Half of those leaving Canada plan on coming back within **5** years. So the "brain drain" may not have a permanent effect.



How many classmates are we intending to stay in touch with?

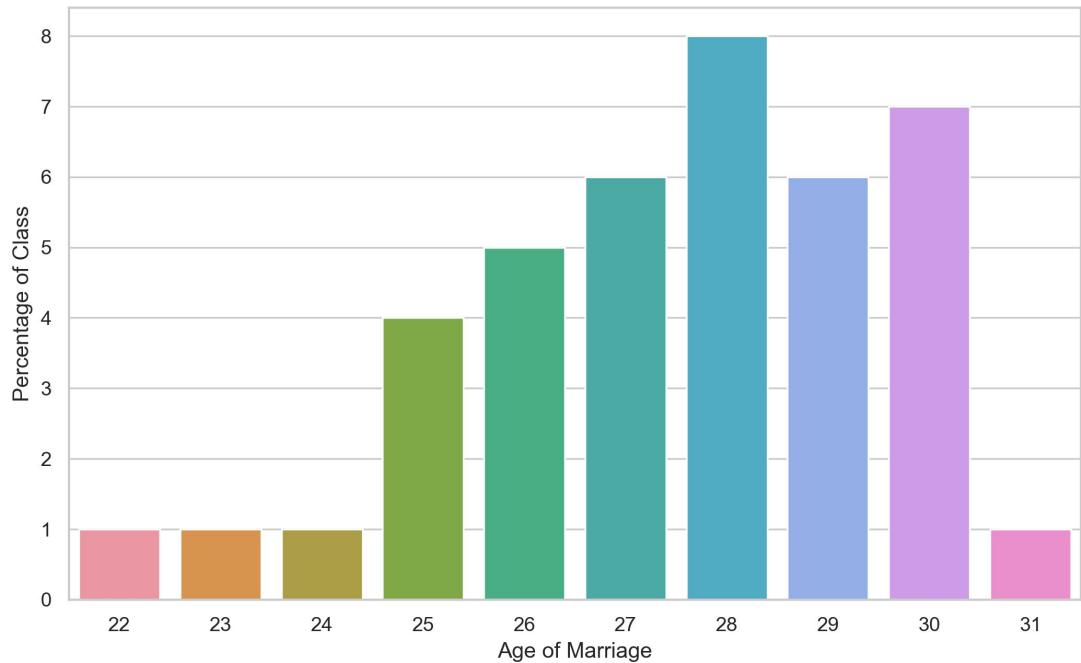
66% of the class plans on staying in touch with at least 5 other BMEs.

4 people did not respond 🤪😢



When do we see ourselves getting married?

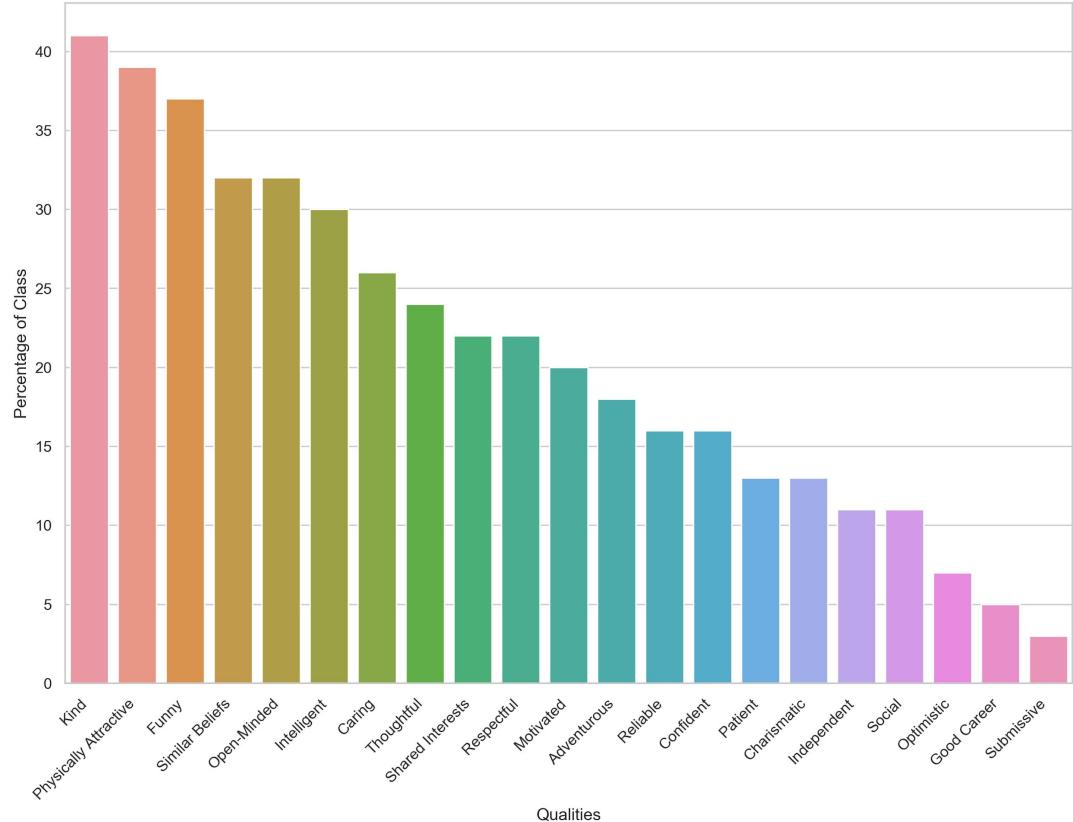
With two students already married, the rest of us who are interested in getting married see ourselves doing so at around **27.5** years old.



What are the top 5 qualities we look for in a partner?

Before we can even think about marriage, we need to be in a relationship!

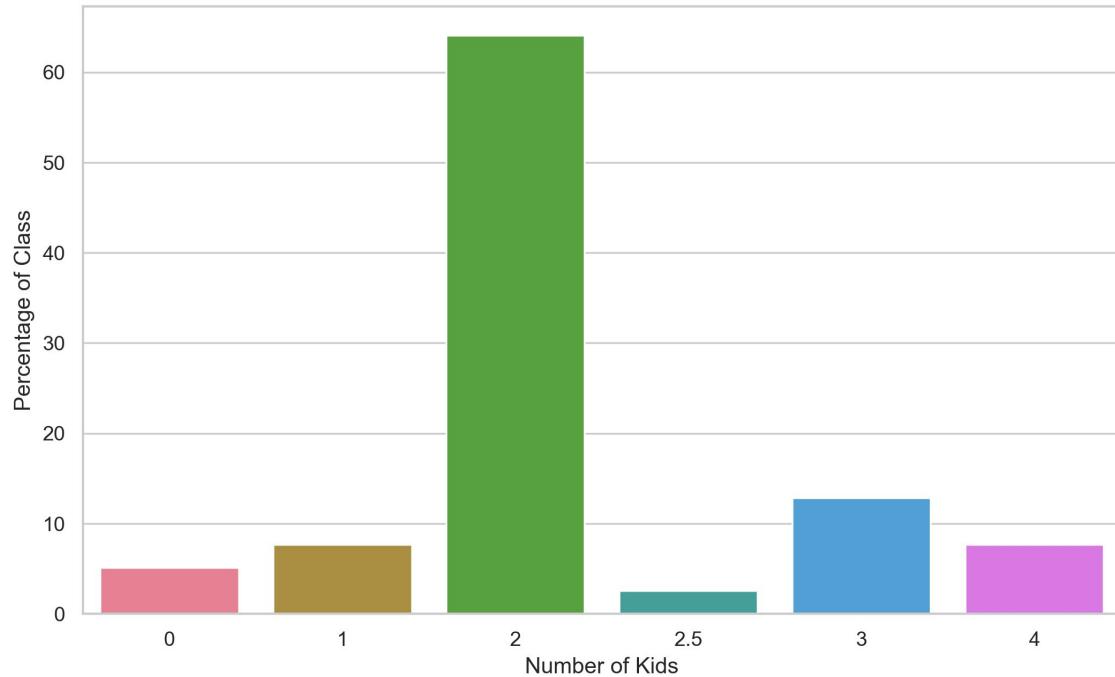
The most popular quality is kindness, and the least popular quality is submissive.



How many kids do we want to have?

A majority of BMEs wanted **2** kids.

Also, $2.5 = 2$ kids + 🐕 ..?



Thanks for Reading!

Thank you for taking the time to read our Biomedical Engineering 2020 Class Profile! We hope you had as much fun reading it as we had making it!

Click [here](#) for more about the program.

We would like to give credits to the [SYDE 2017](#) and [BME 2019](#) class profiles, as we took inspiration from their work.

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Get in Touch

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