SYSTEMS DESIGN ENGINEERING 1A CLASS PROFILE: SYDE 2025

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Alan Zhang: alan.zhang1@uwaterloo.ca
Nicolas Palmar: npalmar@uwaterloo.ca
Nirmal Hegde: nhegde@uwaterloo.ca
Sean Ashley: sean.ashley@uwaterloo.ca
(Names listed in first name alphabetical)

SYDE CLASS 2025 PROFILE

Analyst Notes

Hey there! A huge thank you to everyone in SYDE 2025 who took the time to fill out the information required for this analysis. Also a big round of applause for the web dev, design, and data analytics team for taking the time to analyze and release these results to the public. Without all of these individuals, this report would not be possible!

The analysis in this report represents approximately 82.5% of the SYDE 2025 cohort (94/114 students). Whenever the term “the cohort” is used, it refers to the sample size that filled in the survey, rather than SYDE 2025 as a whole. Additionally, no question was required to be filled out, thus some questions have slightly varying numbers of respondents (the number of students who responded to each question are listed under the “n” value on every slide). This information has been collected to give more insight into what 1A SYDE in the 2020/2021 school year is like. Enjoy!

DISCLAIMER: This is an unofficial class profile conducted by students in SYDE 2025 and is not associated with the University of Waterloo in any manner. The data is shown as a collective, however there are anomalies that are shown. Due to this, please do not try to find out who these people are. Privacy is imperative and those who shared information about themselves presumably do not want their identity revealed. If there are any questions, feel free to email anyone attached to the first slide of this document and we will get back to you ASAP!

Contents

- DEMOGRAPHICS
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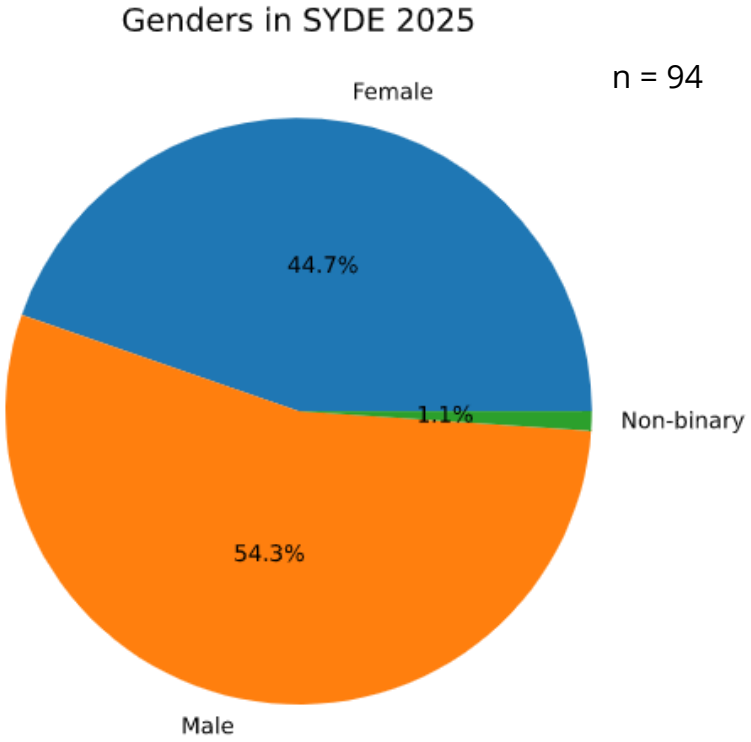
DEMOGRAPHICS

Gender

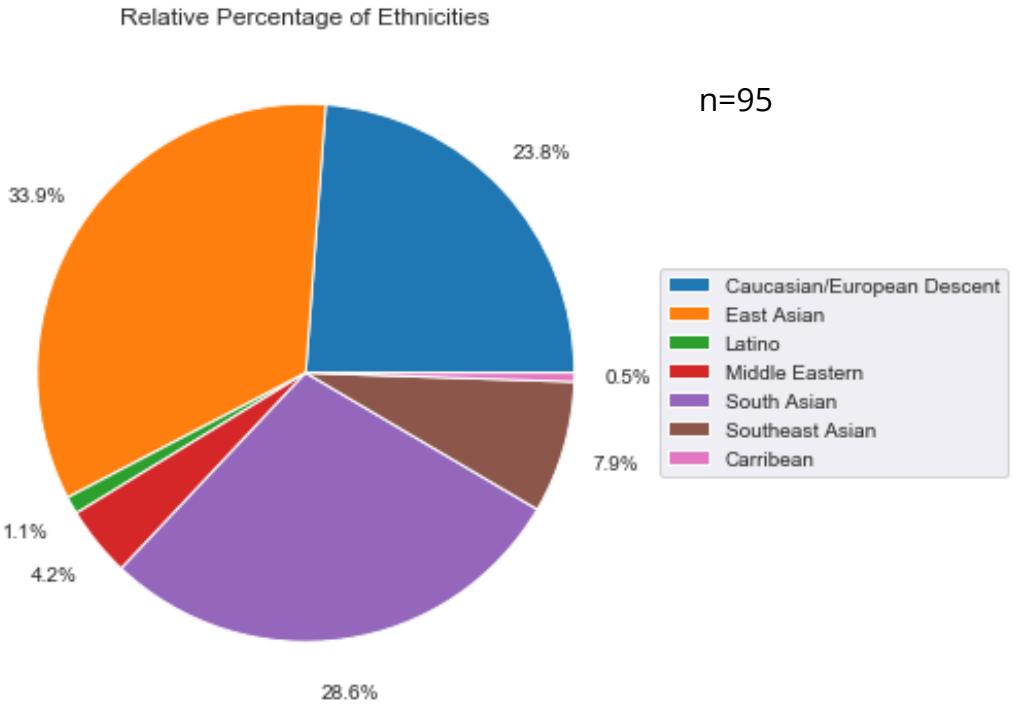
There is about an equal representation of both females and males in SYDE 2025, with slightly more males than females.

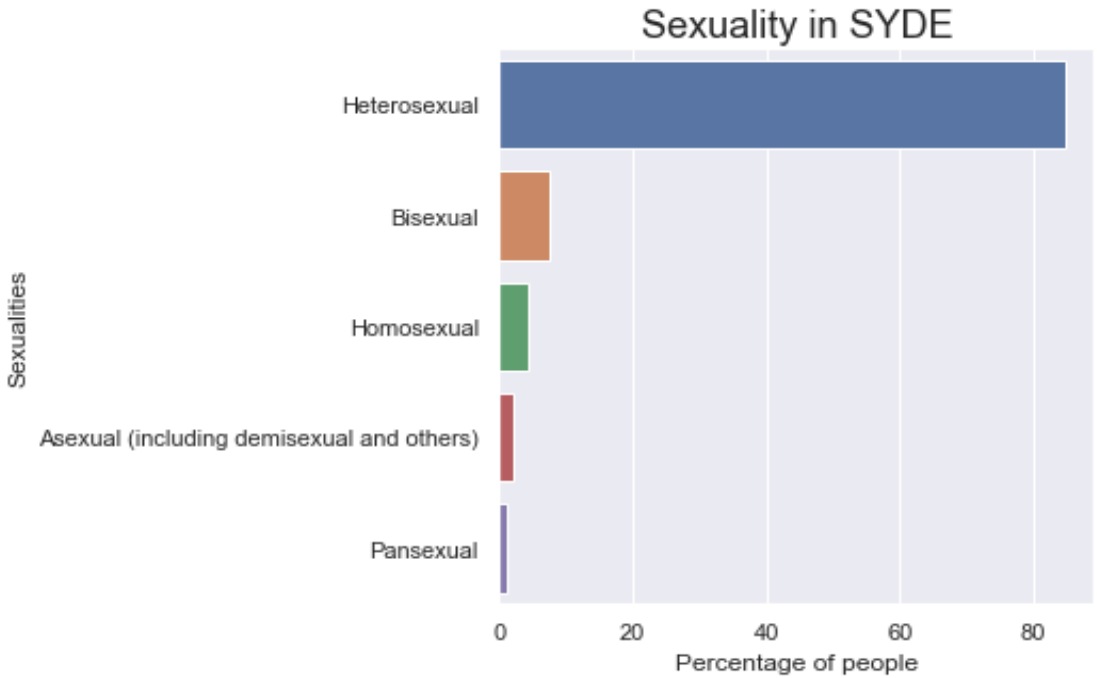
This contrasts to the SYDE 2024 Cohort, which had a greater amount of females than males [1].



Ethnicities

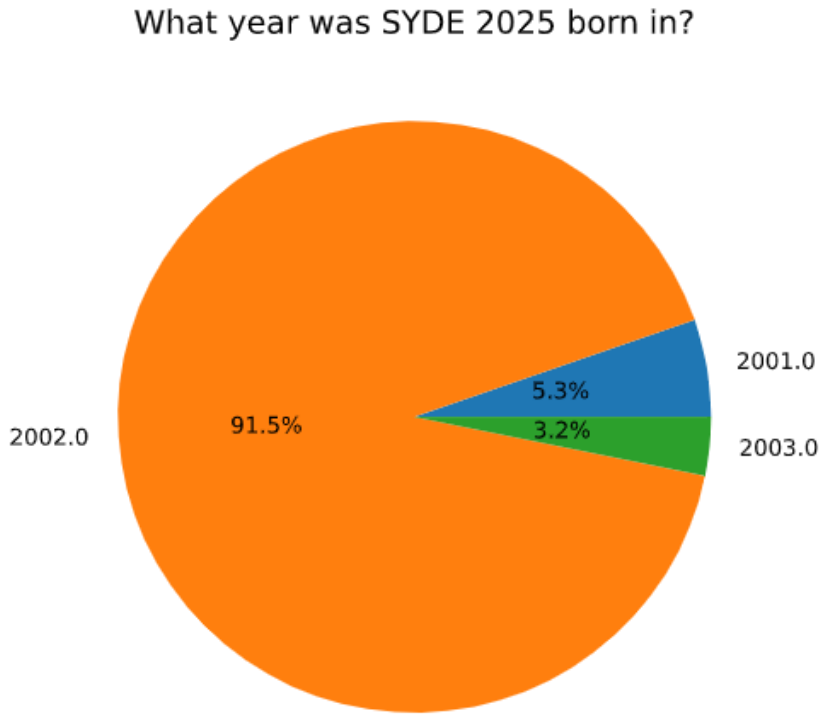
The majority of the SYDE 2025 cohort is Asian or Caucasian, similar to past class profiles [1][2].





SEXUALITY

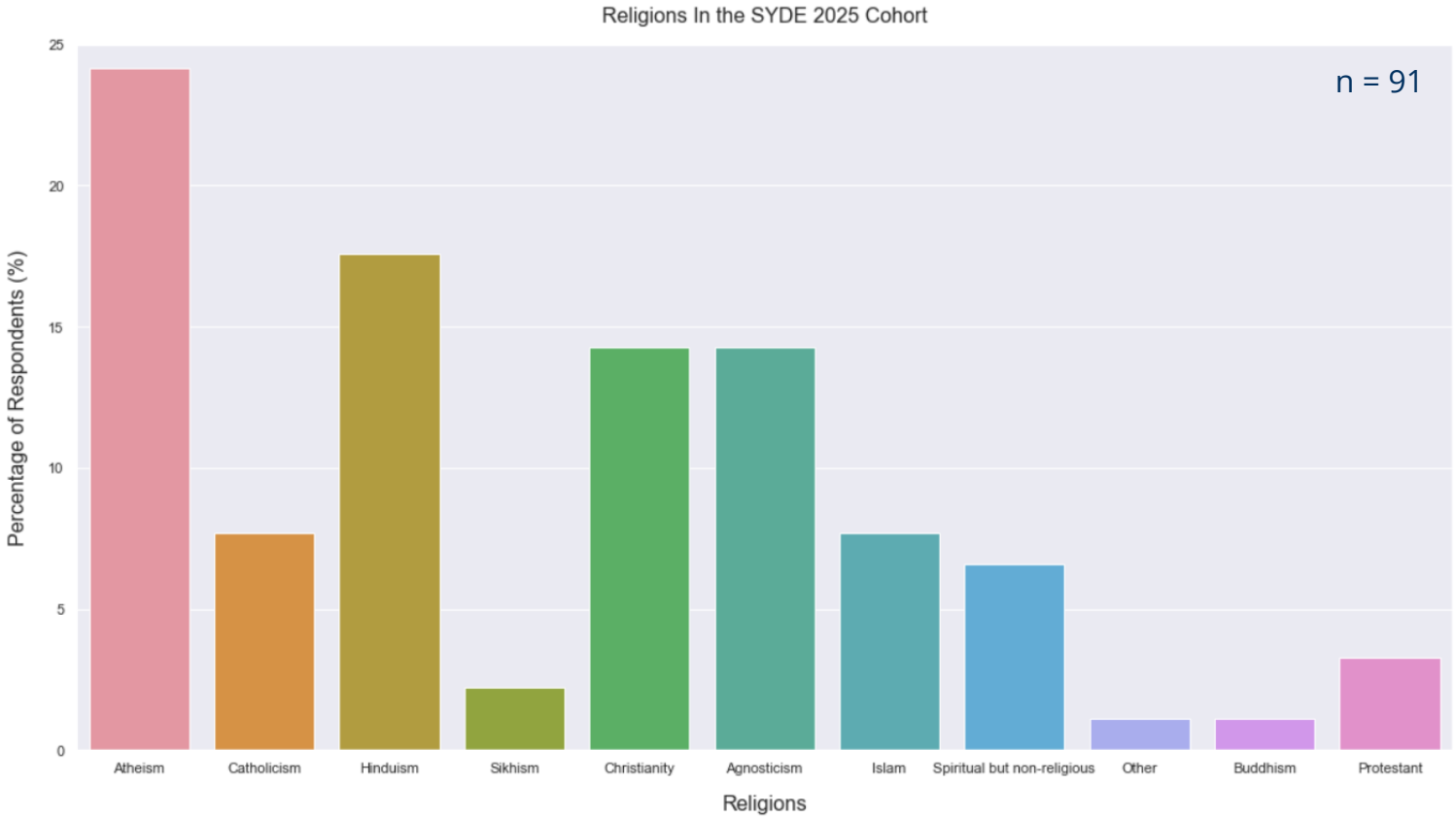
n = 92



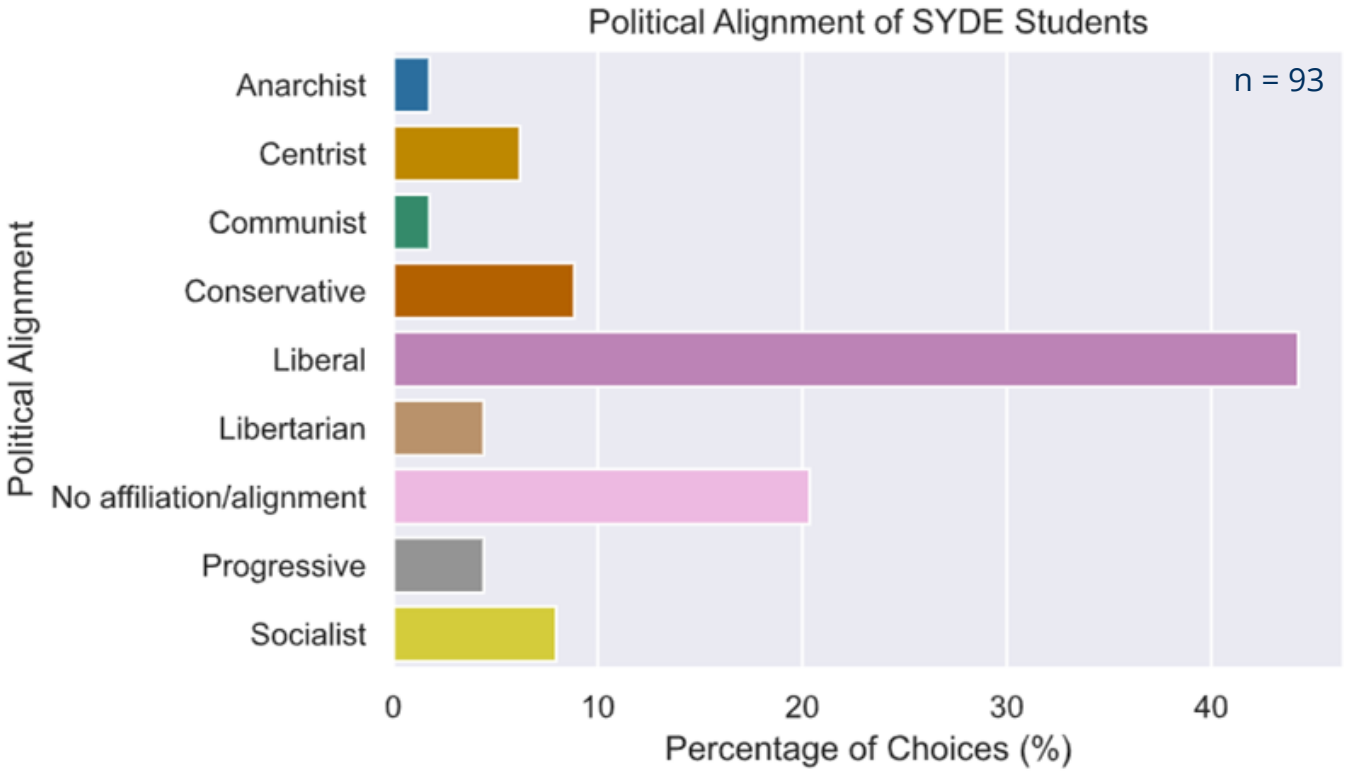
YEAR BORN

n = 94

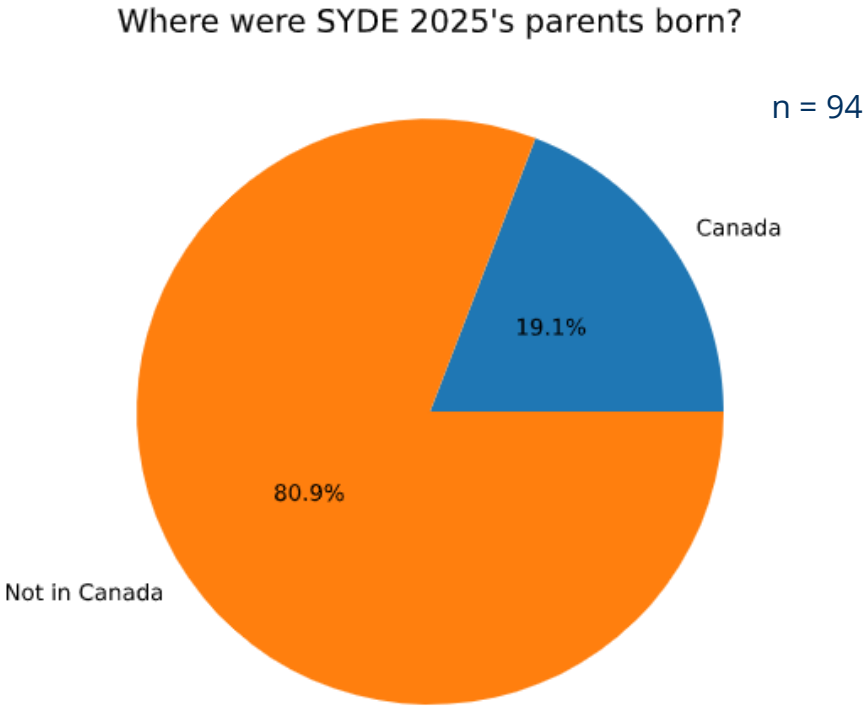
Religion


Religions In the SYDE 2025 Cohort
n = 91
Percentage of Respondents (%)
0
5
10
15
20
25
Atheism
Catholicism
Hinduism
Sikhism
Christianity
Agnosticism
Islam
Spiritual but non-religious
Other
Buddhism
Protestant
Religions

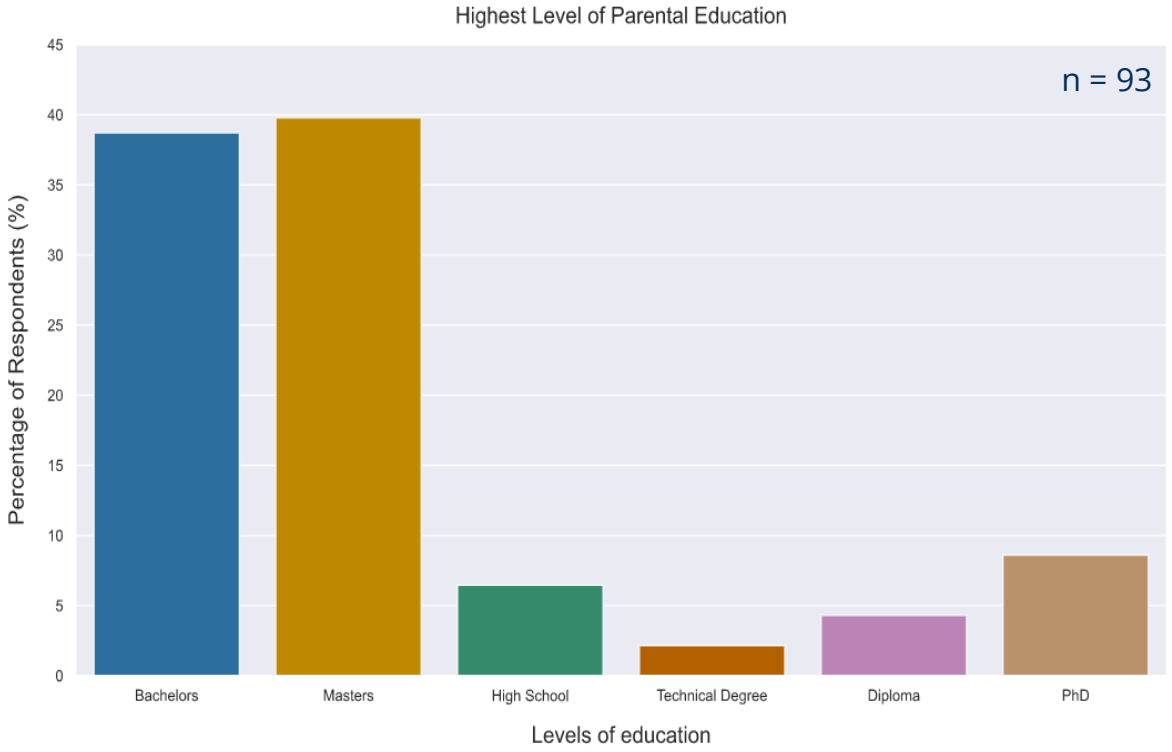
Political Alignment



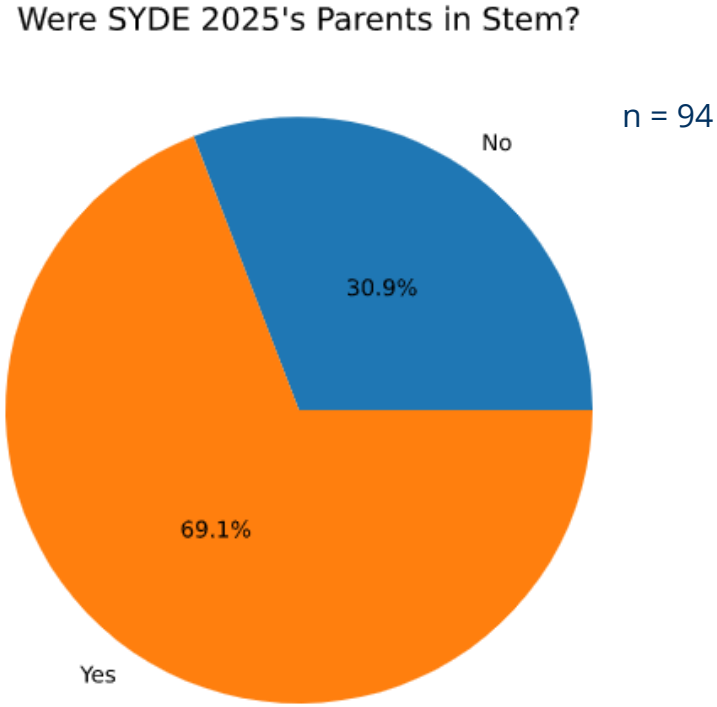
Parent Birth Origin (at least one parent)



Parents’ Education Level

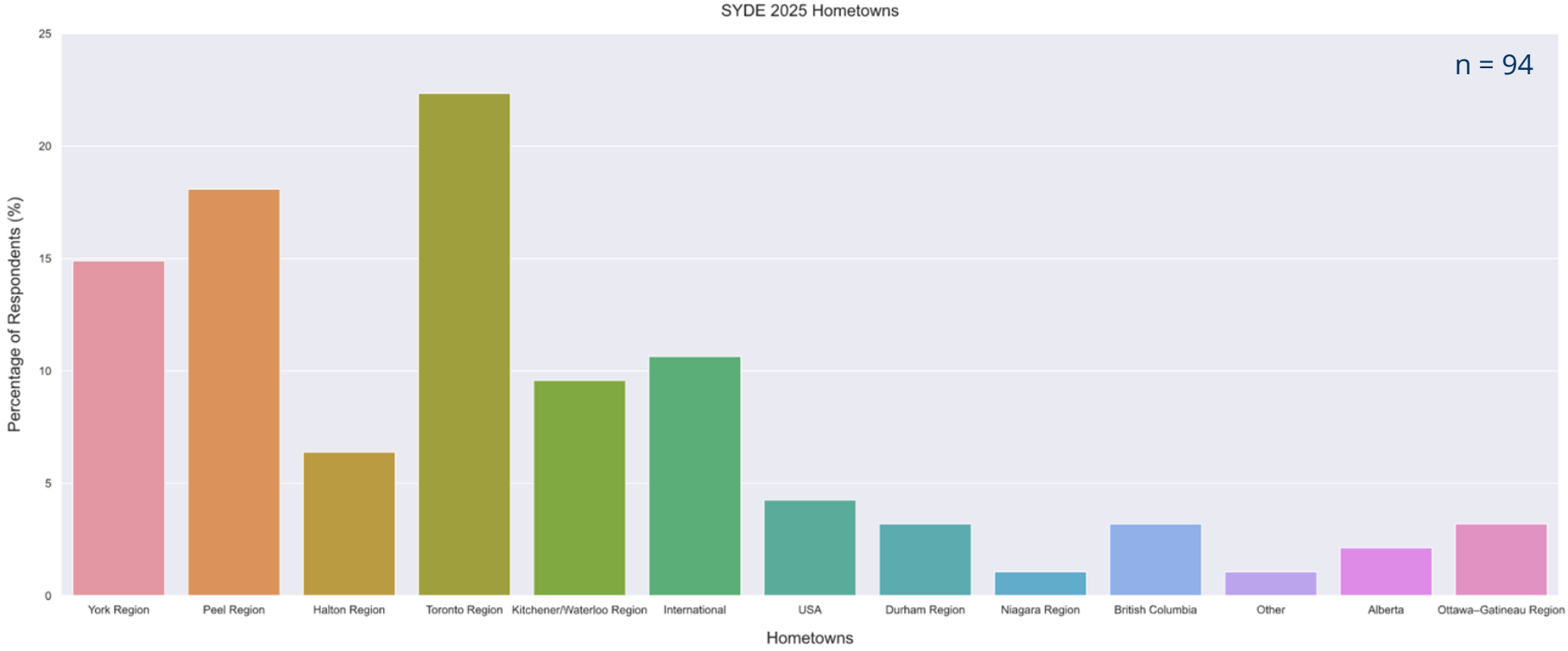


Students with at least one parent In STEM



n = 94

Hometowns

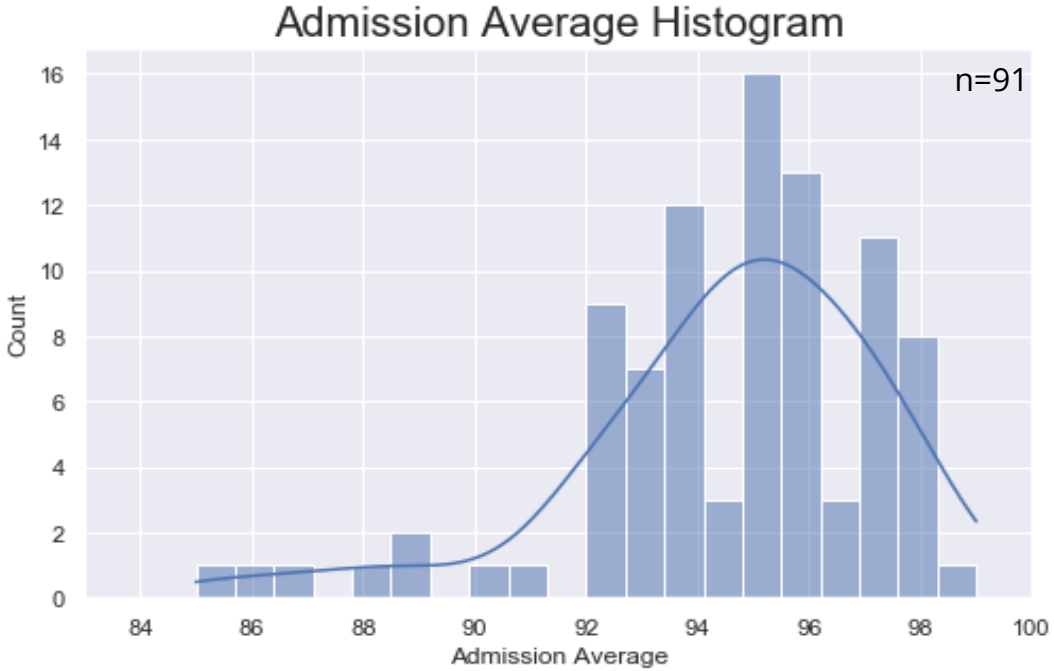

SYDE 2025 Hometowns
n = 94
Percentage of Respondents (%)
0
5
10
15
20
25
York Region
Peel Region
Halton Region
Toronto Region
Kitchener/Waterloo Region
International
USA
Durham Region
Niagara Region
British Columbia
Other
Alberta
Ottawa–Gatineau Region
Hometowns

ACADEMICS

High School

Mean Admission Average: 94.53% | Median Admission Average: 95.00% | Standard Deviation: 2.72%

The admission average was in the mid 90s - slightly higher than the “high 80s to low 90s” [3] currently on the admissions website. Lots of smarties inSYDE!

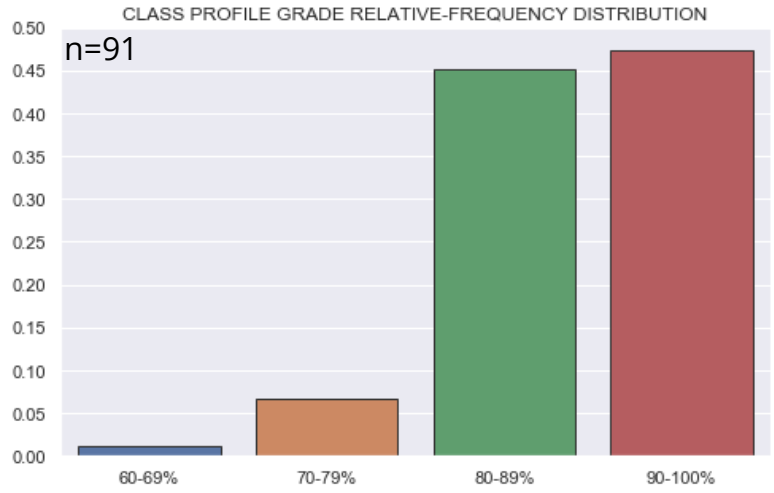


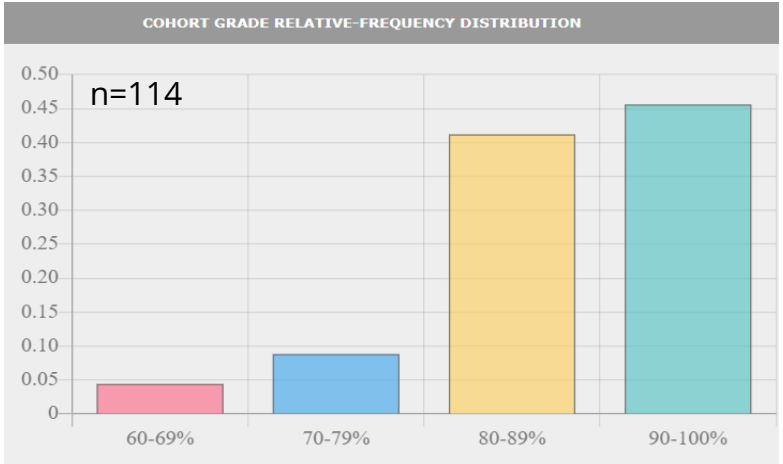
University

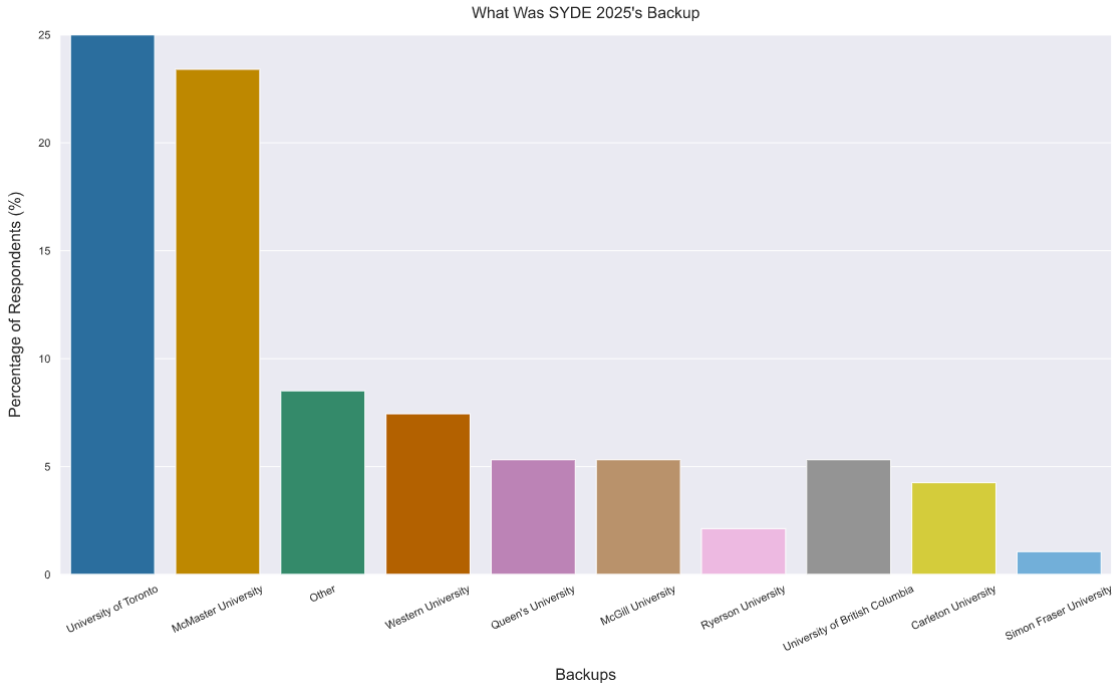
This year engineering rankings were removed for the first time and instead, a grade relative-frequency histogram was provided by UW.

To keep inline with these efforts, the same histogram was created with the data from those who answered the class profile survey (class profile histogram above, histogram from https://engug.uwaterloo.ca/results below).

Evidently, the class profile data has a higher frequency of averages in the 80-89% range as well as the 90-100% range (and less in the other two ranges). **This means that data analysis in this report done with grades is skewed slightly upwards** - it seems many of the people who did not respond to the survey had averages in the 60-79% range.





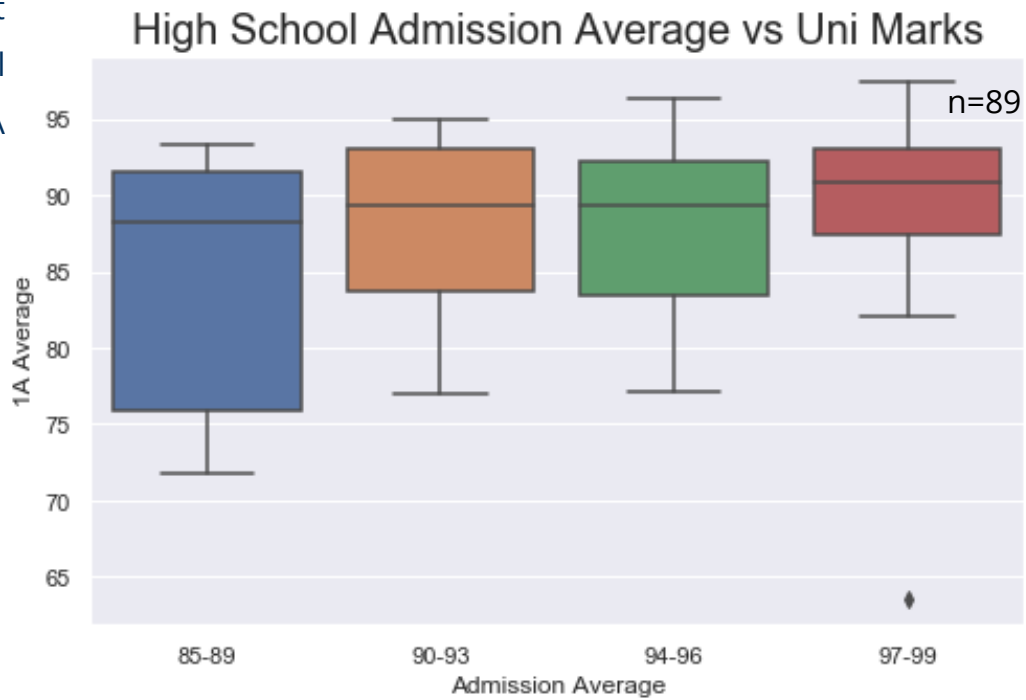


SYDE STUDENTS' 2ND CHOICE

n = 94

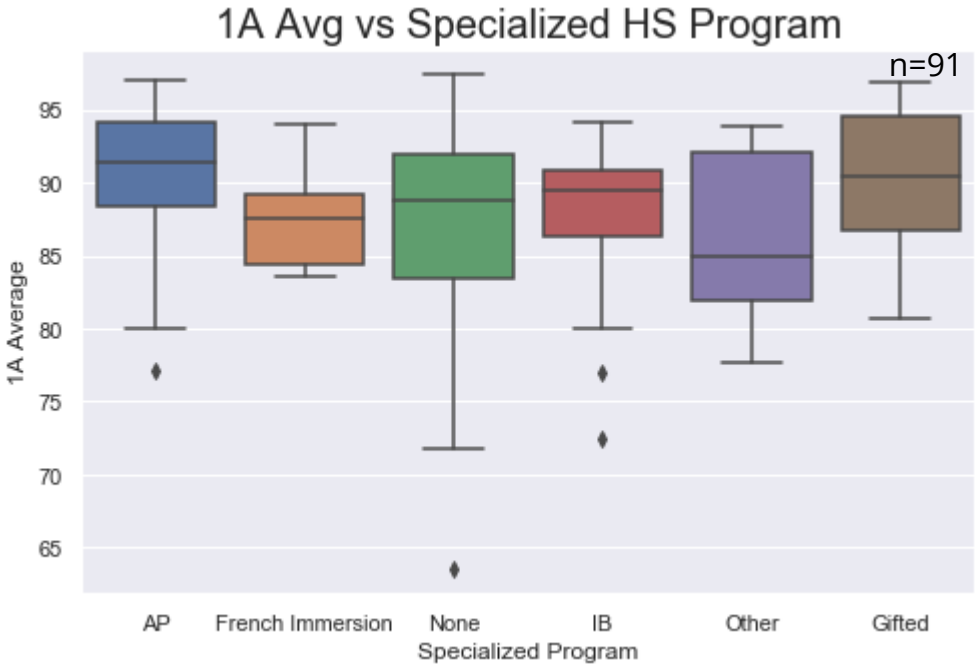
High School vs University: Averages

The Pearson Correlation Coefficient between admission average and 1A average was about 0.16. This would indicate that there is a small association [4] between admission average and 1A average.



High School vs University: Specialized Programs

Specialized Program	1A Mean	1A Median	Count
AP	90.36%	91.36%	19
French Immersion	87.64%	87.55%	6
Gifted	90.13%	90.50%	8
IB	87.50%	89.50%	20
None	87.53%	88.72%	37
Other	86.20%	85.00%	8

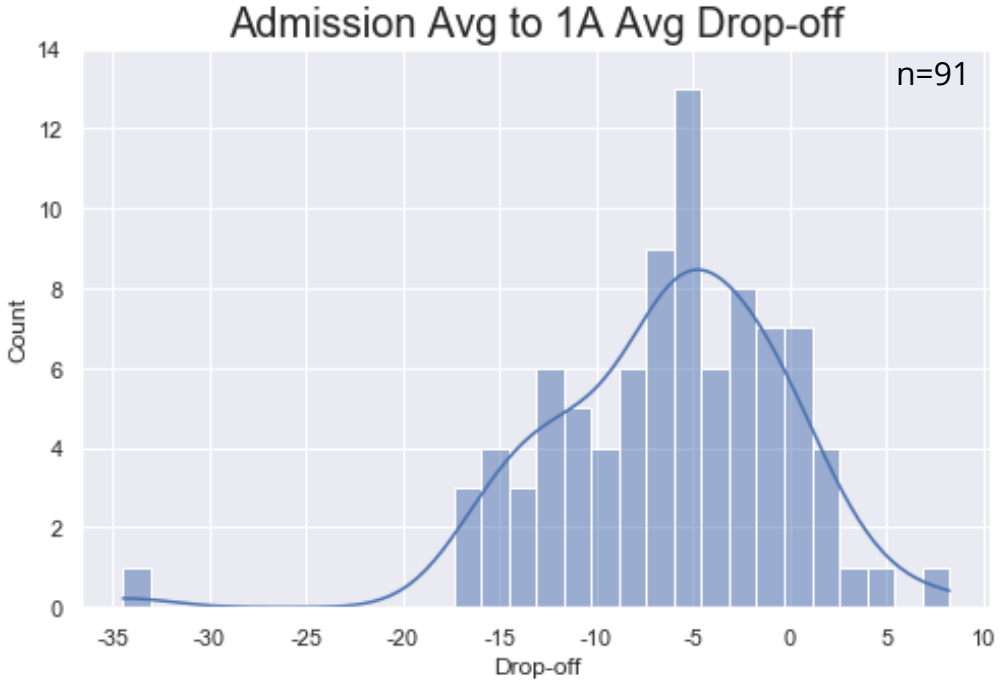


High School vs University: Academic Drop-off

Academic drop-off is calculated by: 1A average - admission average.

The median drop-off was 5.6%. Last year, the median drop-off was 15.9% [1].

Note: The Fall 2020 term took place online.

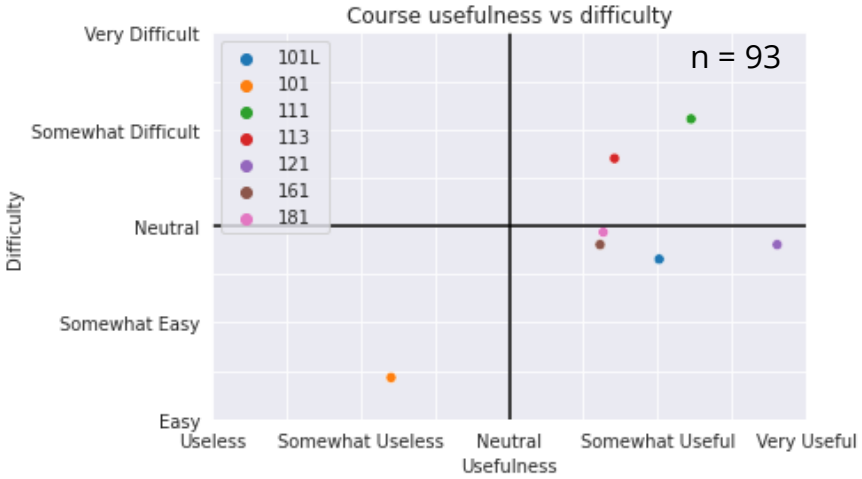


Difficulties vs Usefulness

Usefulness and difficulty have a 0.31 spearman correlation coefficient, indicating a moderate positive relationship (The harder it is, the more useful it is).

The easiest rated course was SYDE 101 (Communications in Systems Design Engineering-Written and Oral), and the hardest was SYDE 111 (Fundamental Engineering Math 1).

The most useful rated course was SYDE 121 (Digital Computation) , and the least useful rated was SYDE 101 (Communications in Systems Design Engineering-Written and Oral).

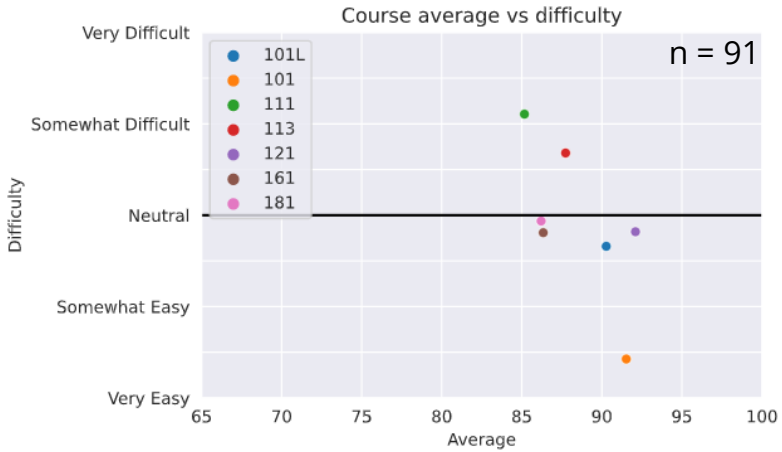


Difficulty vs Course Average

The easiest course on average was SYDE 101 (Communications in Systems Design Engineering-Written and Oral), which also had a high average (91.5%).

The hardest course was SYDE 111 (Fundamental Engineering Math 1) on average, which also had the lowest average (85.2%).

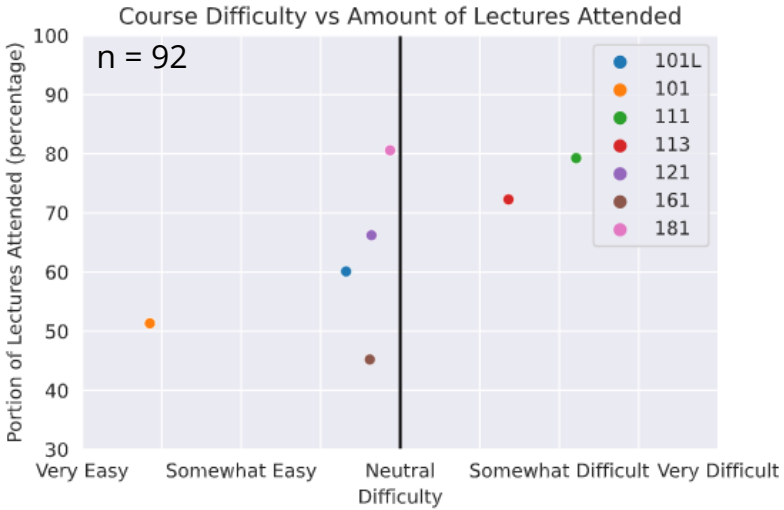
Course average and difficulty have a -0.33 spearman correlation coefficient, indicating a moderate negative relationship (The higher the average, the easier the course was).



Difficulty vs Amount of lectures attended

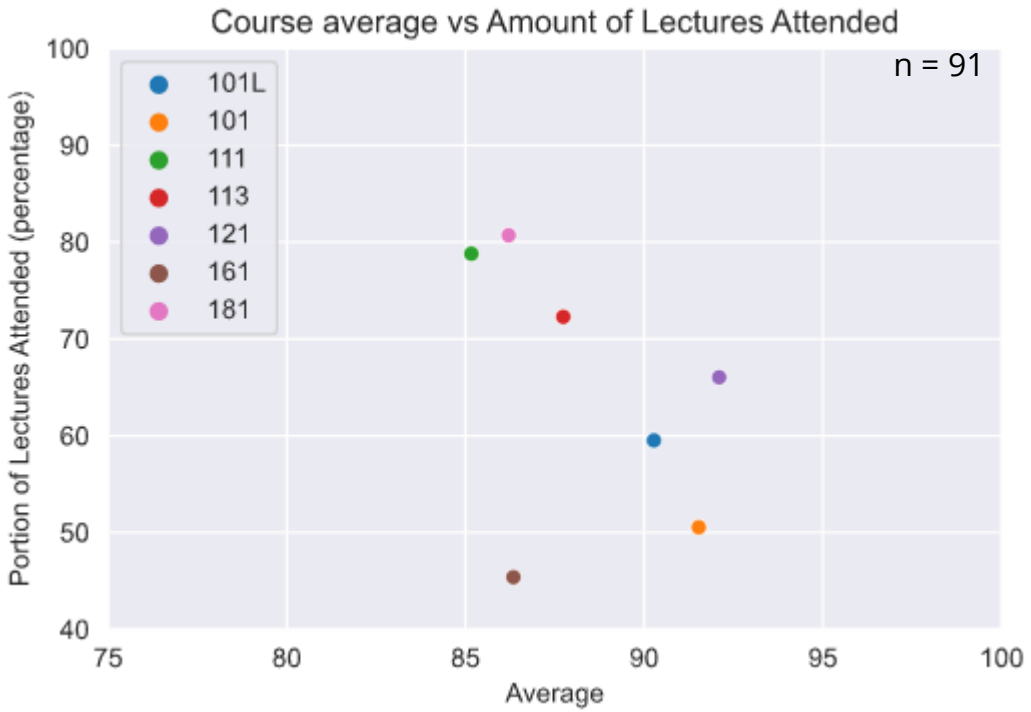
Number of lectures attended, and difficulty have a 0.21 spearman correlation coefficient, indicating a moderate positive relationship (The higher the difficulty of the course, the more lectures that were attended.

SYDE 181 (Physics 1 : Statics) had the highest percentage of lectures attended at around 80%, and SYDE 161 (Introduction to Design) had the lowest percentage of lectures attended at around 45%.



Average vs Amount of lectures attended

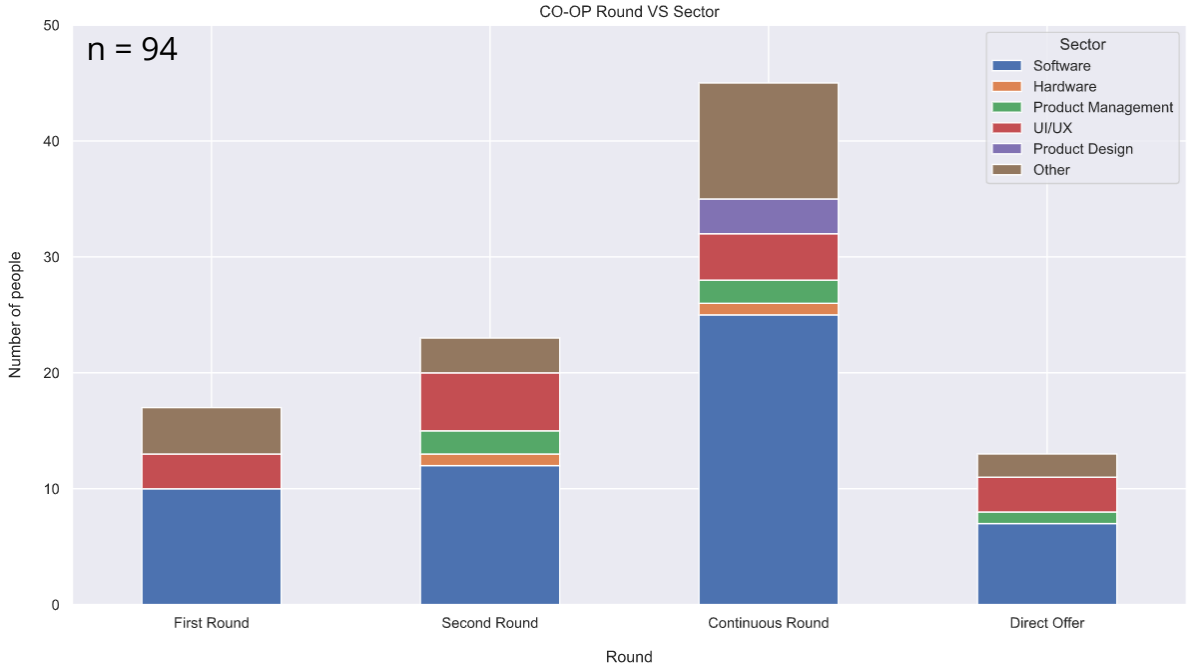
Course average and difficulty have a -0.0055 spearman correlation coefficient, indicating essentially no relationship.



CO-OP

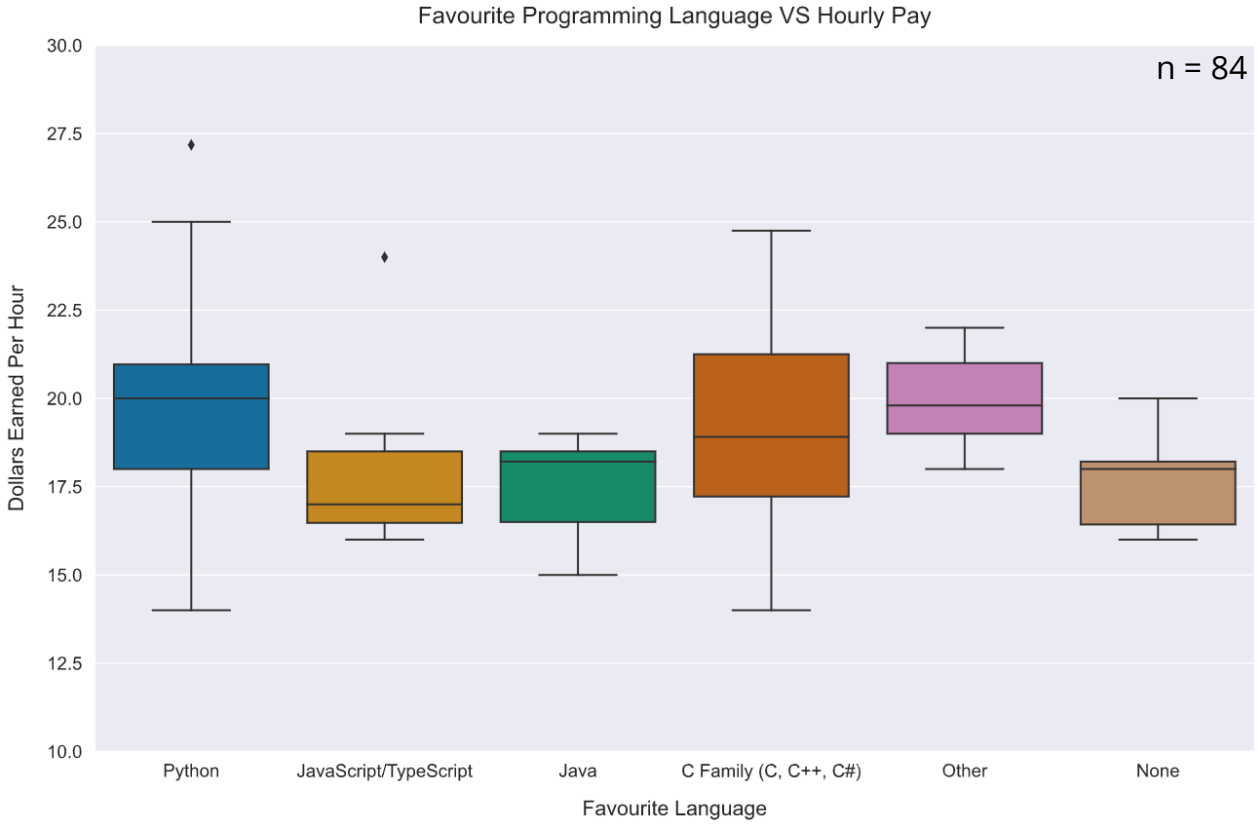
CO-OP Round VS Type of CO-OP

Software development (including QA) was the most popular sector for our cohort in every round, similar to the SYDE 2024 Cohort [1].



Favourite Programming Language VS Pay

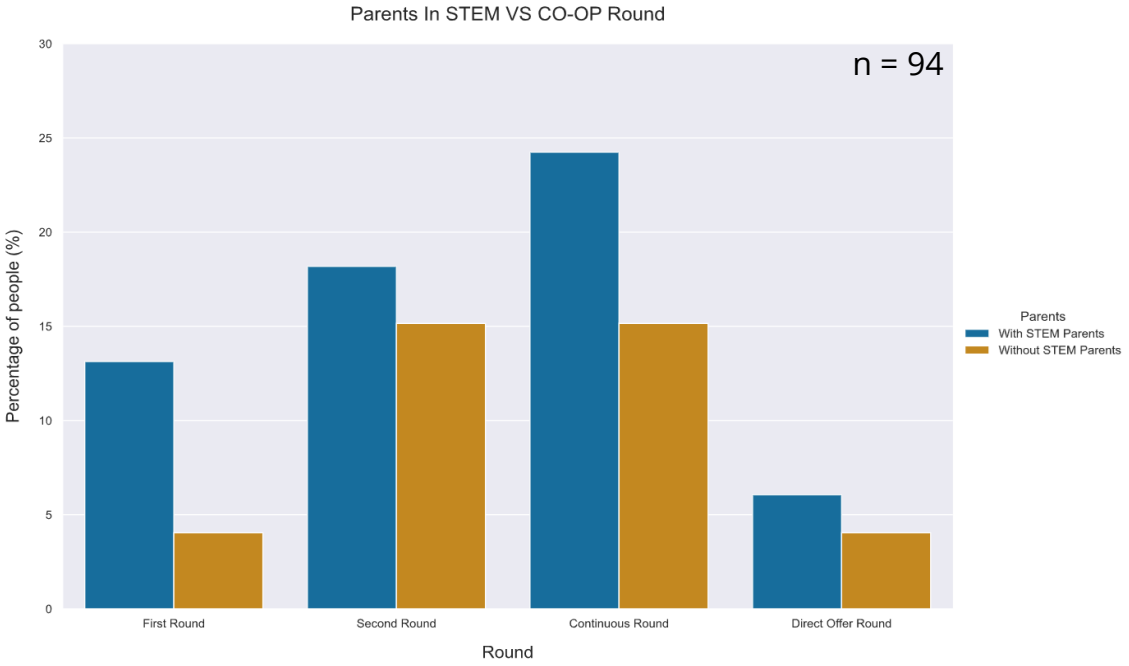
People who liked Python had the highest median hourly pay.



People With Parents In STEM VS CO-OP Offer Round

The majority of people without parents working in a STEM position secured a job during the continuous round.

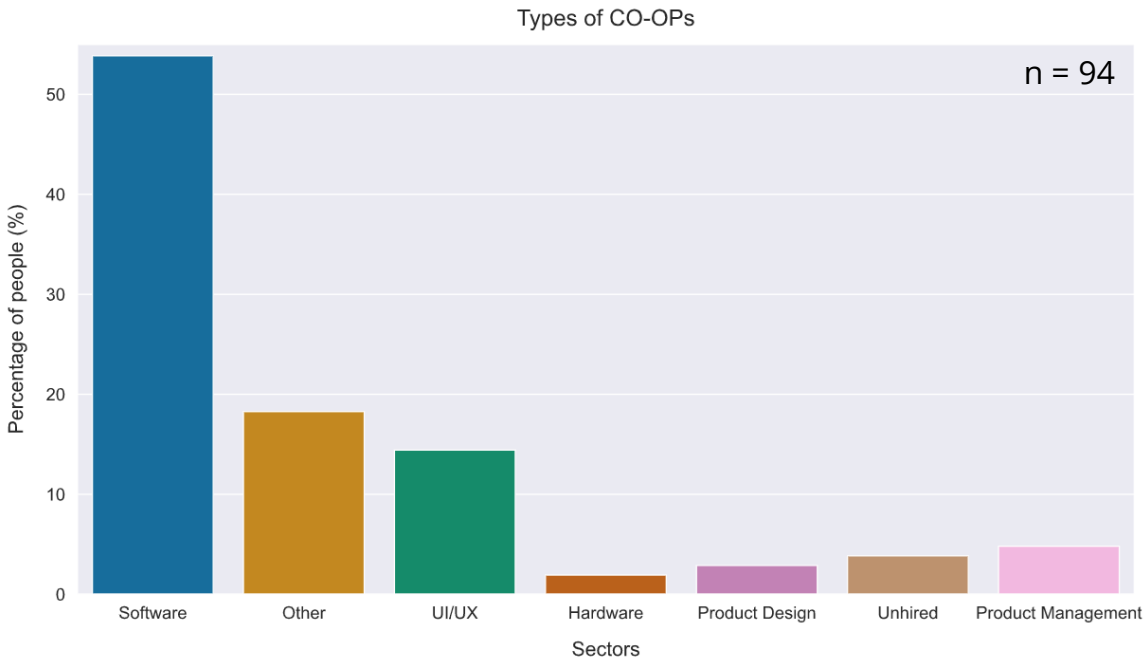
Compared to those with parents in STEM, there is a large disparity with people getting jobs in earlier rounds.



Types of CO-OPs

Most of the cohort have been employed in the software industry, like previous cohorts [1][2].

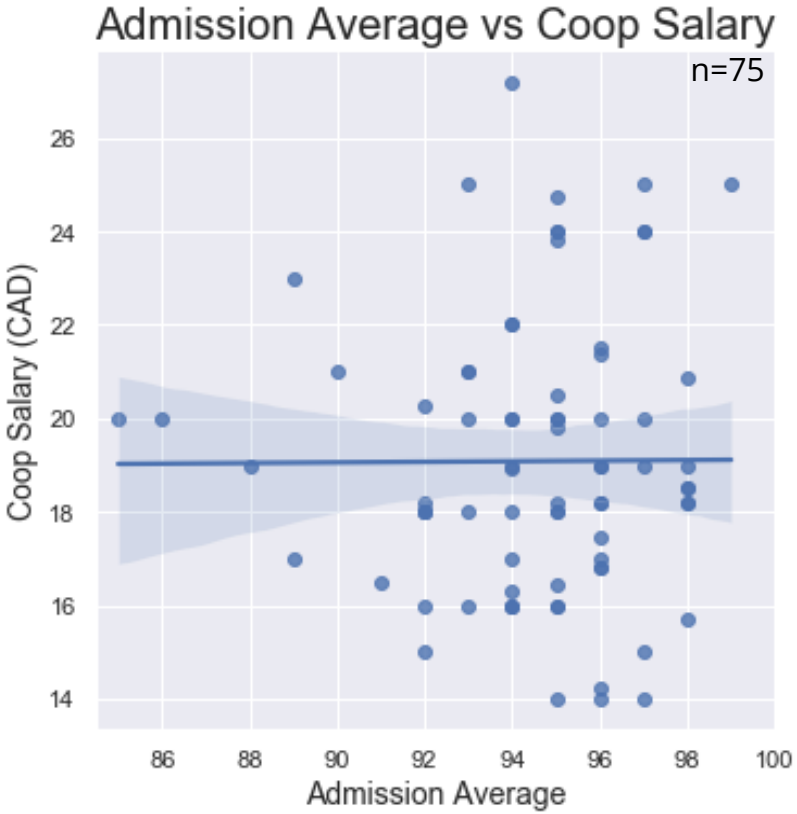
Note: The number of unhired people has decreased since this survey was taken, with currently one person being unemployed [5].



Co-op Pay vs Admission Average

Admission average and salary have a pearson correlation coefficient of 0.006. This indicates no association and therefore no correlation between high school admission average and 1A coop salary.

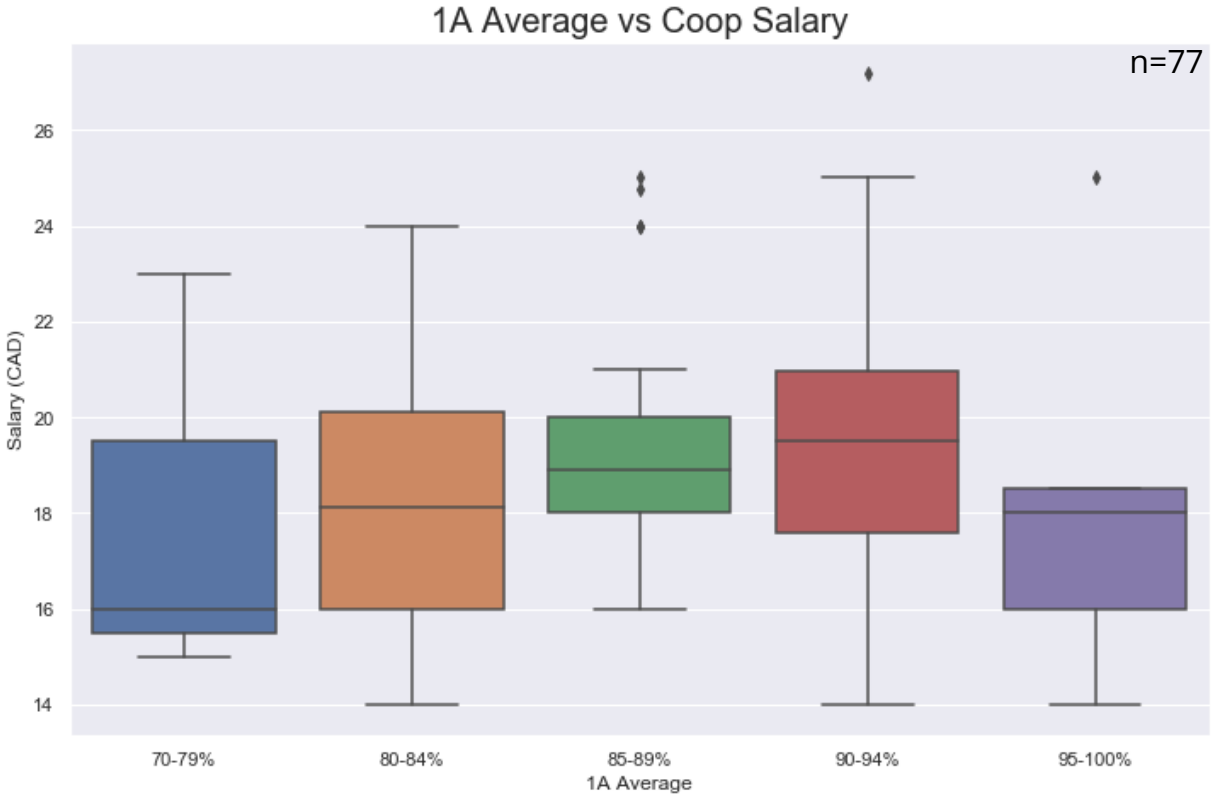
SYDE Opinion: Employers don't care about high school marks.



Co-op Pay vs 1A Average

Doing better in school does not seem to correlate with getting paid more; the pearson correlation coefficient was 0.06.

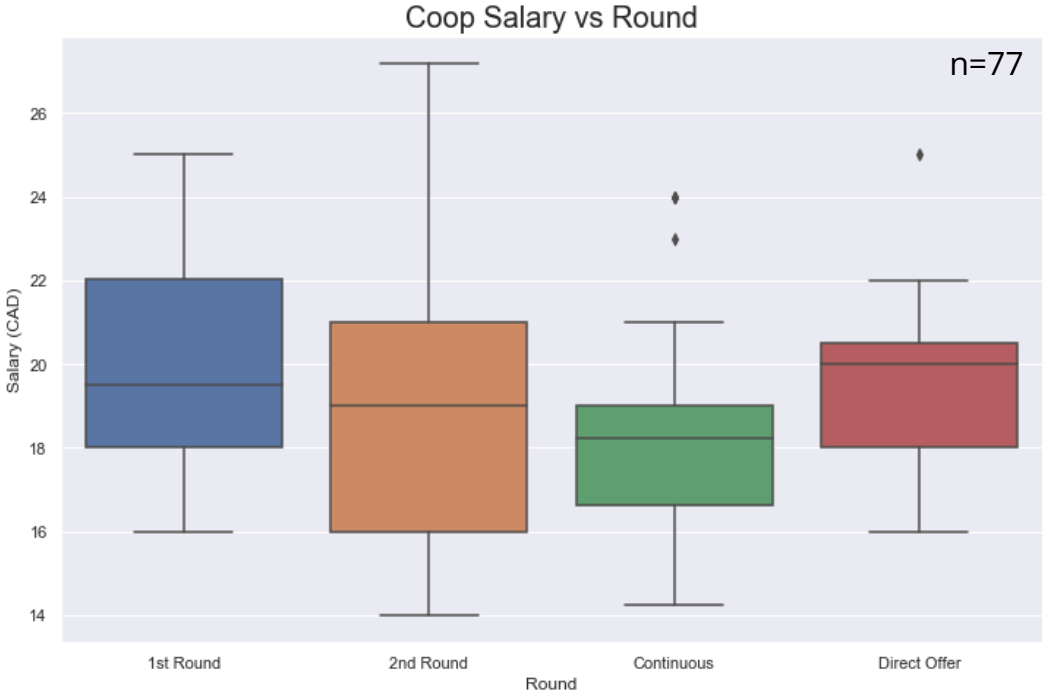
Note: 1A averages were not seen by employers during the coop hiring process; they were released after coop hiring.



Coop Pay vs Round

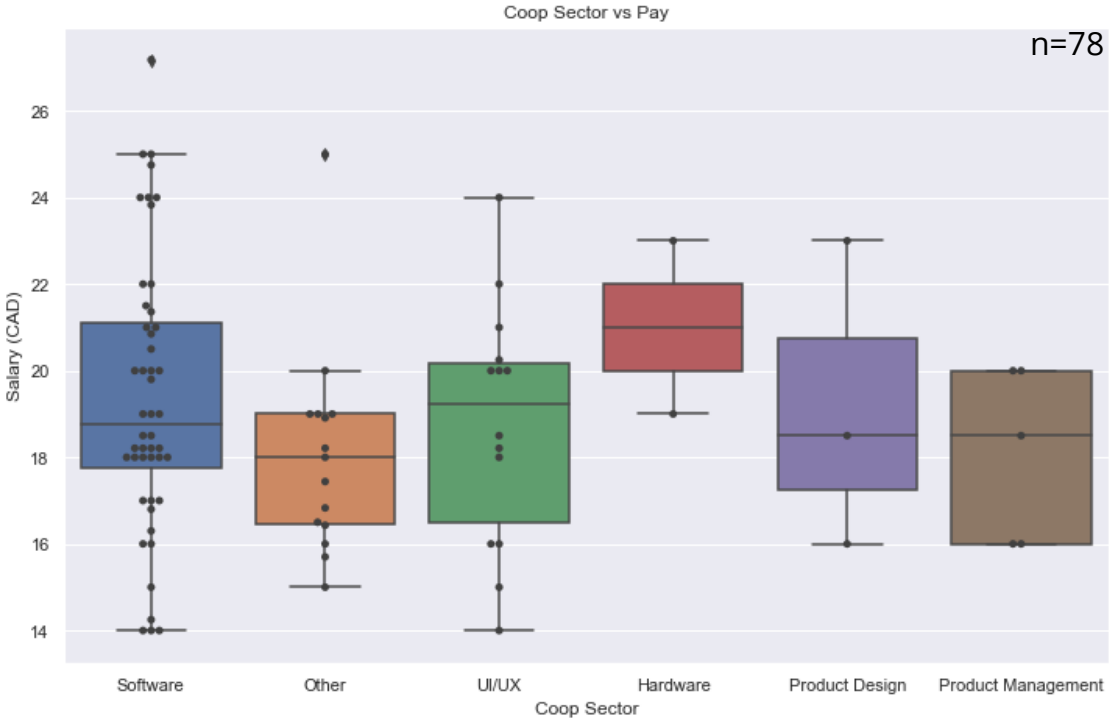
The average engineering coop salary for 1A students is $18.50/h [6]. The SYDE 1A average coop salary was slightly higher, with students getting paid an average of $19.11/h.

Round	Mean	Median	Count
1st	$20.13	$19.50	16
2nd	$19.04	$19.00	21
Continuous	$18.39	$18.21	31
Direct Offer	$19.94	$20.00	9



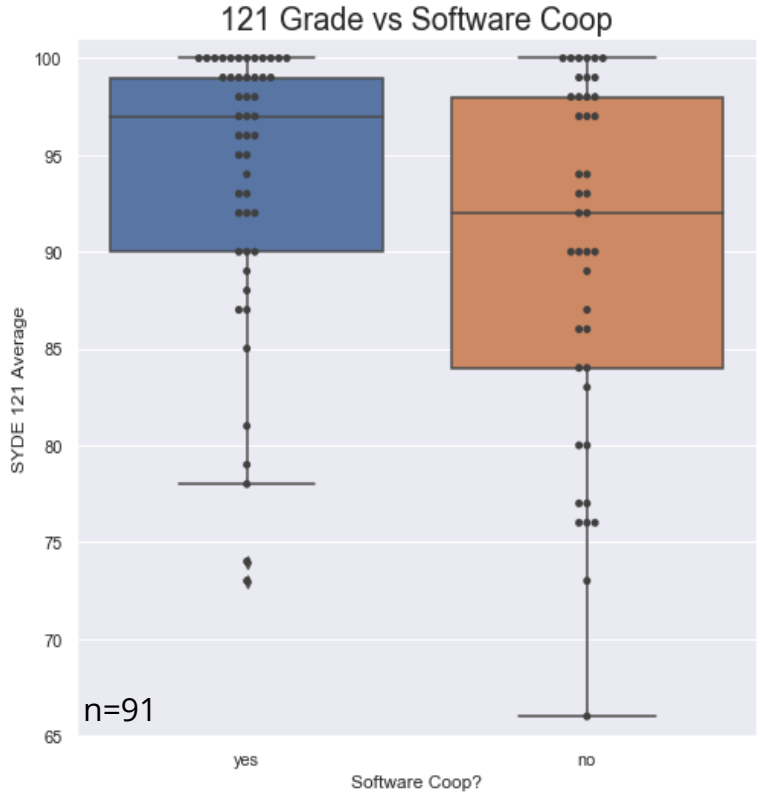
Co-op Sector vs Pay

Sector	Mean	Median
Hardware	$21.00	$21.00
Software	$19.37	$18.75
Product Design	$19.17	$18.50
UI/UX	$18.78	$19.25
Product Management	$18.10	$18.50
Other	$18.07	$18.00



Software Co-op vs SYDE 121 Grade

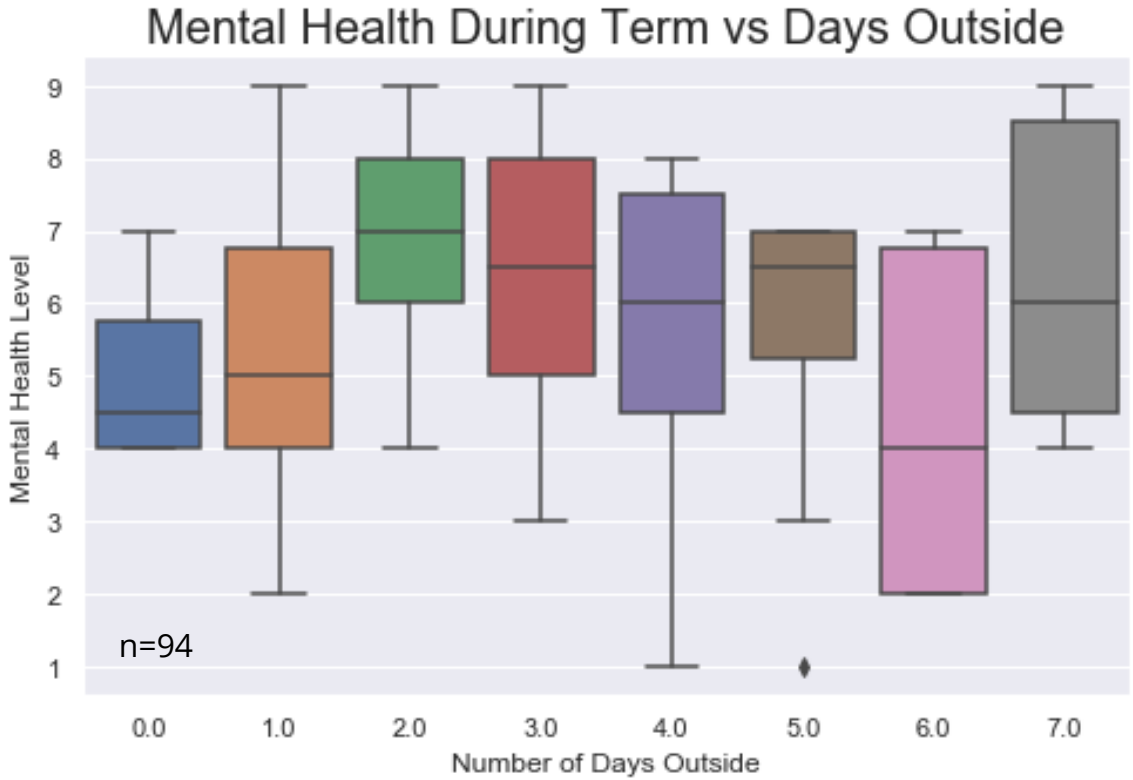
The median SYDE 121 (Digital Computation) grade for people who had a software coop was 97% compared to 92% for those who did not have a software coop.



LIFESTYLE

Days Outside vs Mental Health

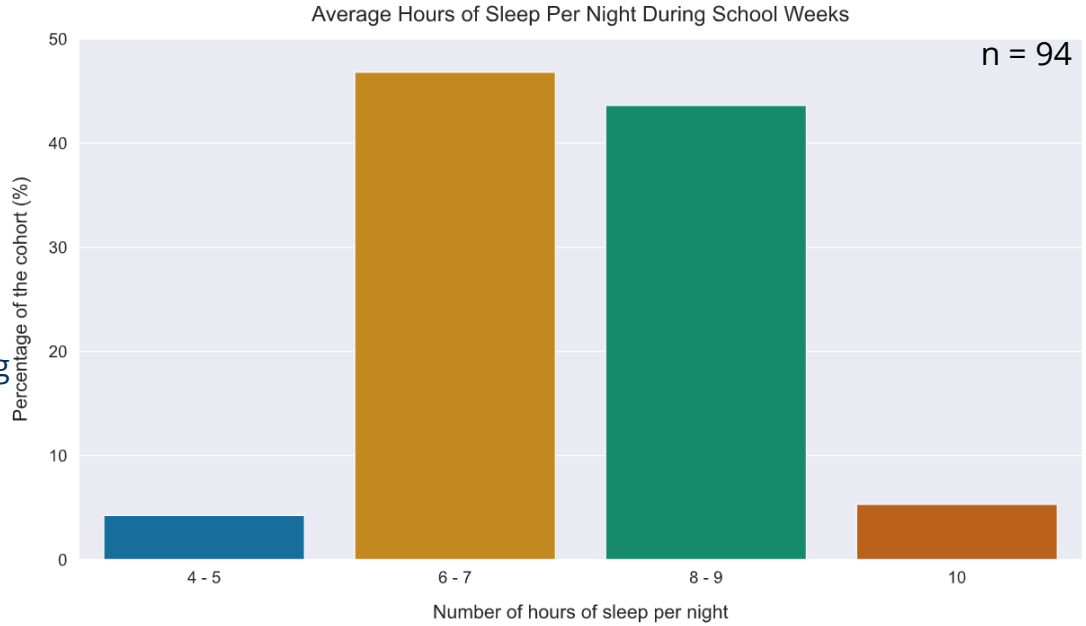
Note: This was a fully online school term - yes, it was possible to go outside 0 days/week.



Hours of Sleep During 1A

Approximately 25% of the cohort has had 7 hours of sleep during 1A, while 22% has had 8 hours of sleep on average.

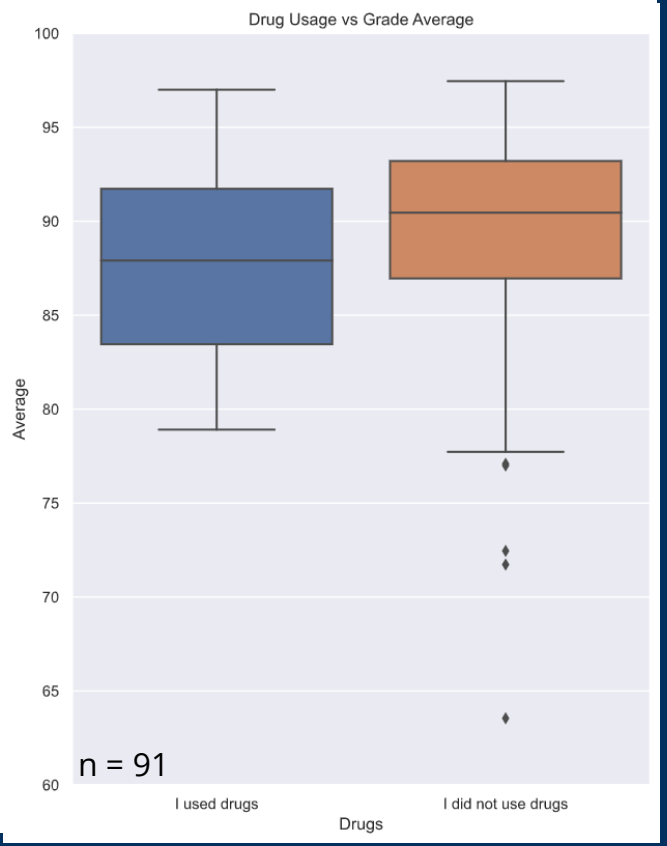
This is close to the recommended 8 hours of sleep for an adolescent aged 13-18 according to the CDC [7].



Drug Usage VS 1A Average

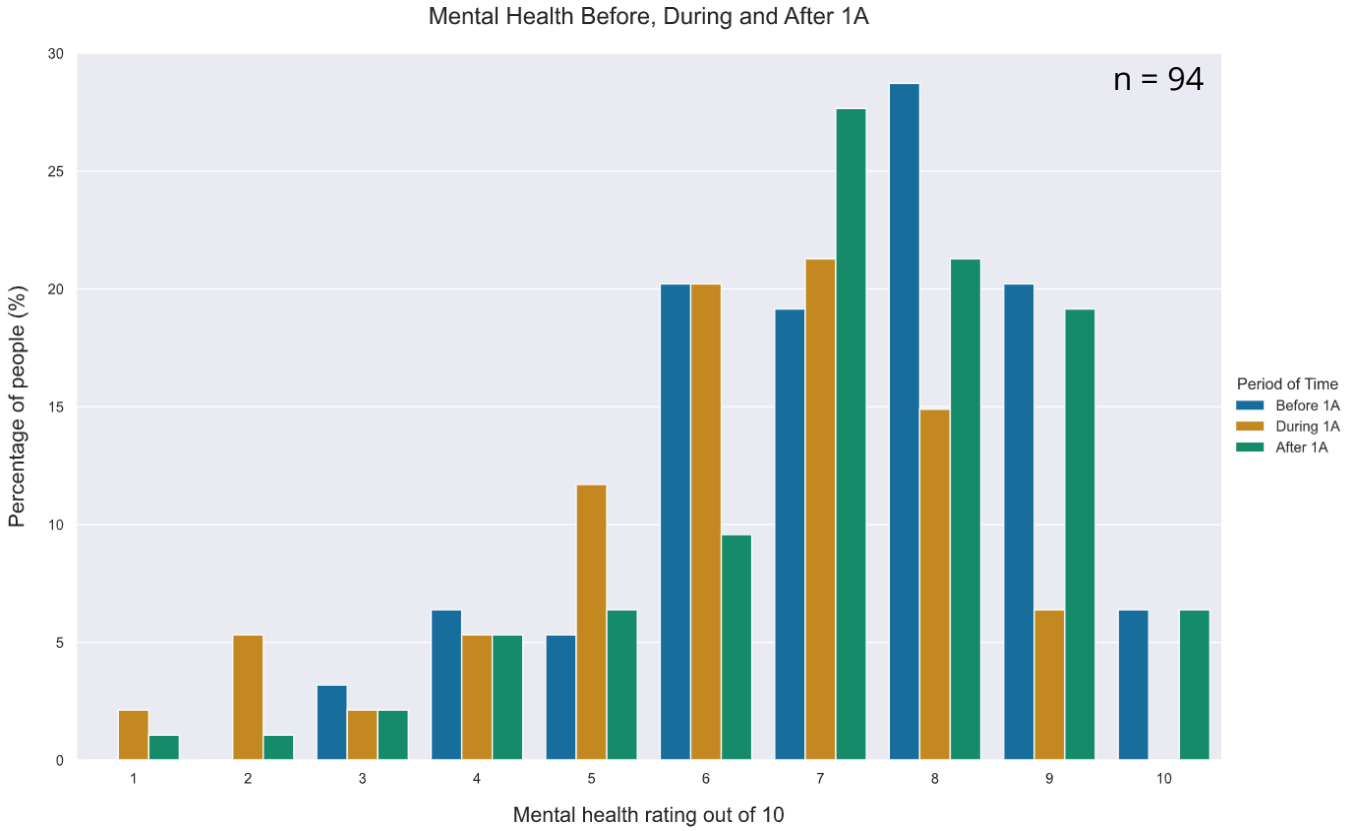
According to the mean average of those who used and did not use drugs, it seems as though the use of such substances does not correlate much with how well they perform in school.

However, there are quite a few noticeable low scoring outliers with people who did not consume drugs, while those who have does not have any particular low scoring outliers.



Mental Health Before, During and After 1A

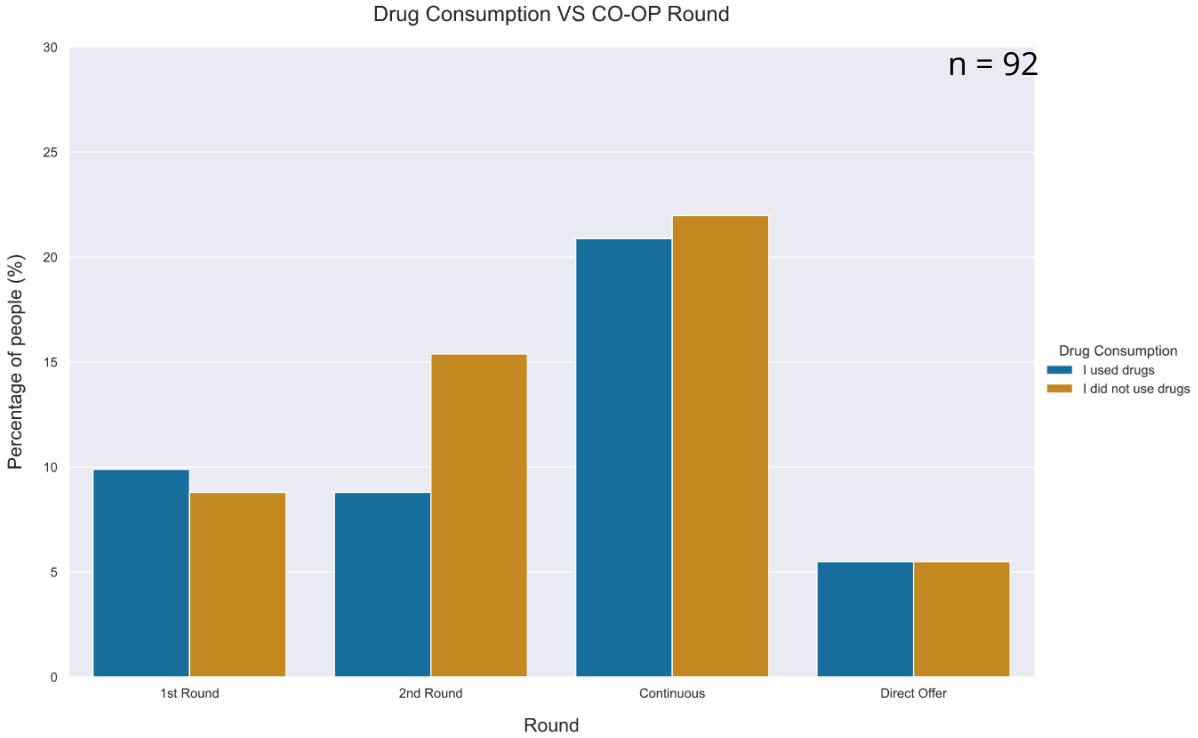
The scale that we used was from 1-10, with 1 being the worst, and 10 being the best.



Drug Consumption VS CO-OP Round

The majority of people who consumed drugs, about 19%, got a job during the continuous round.

Similarly, the majority of people who did not consume drugs got a job during the continuous round, that being about 20%.

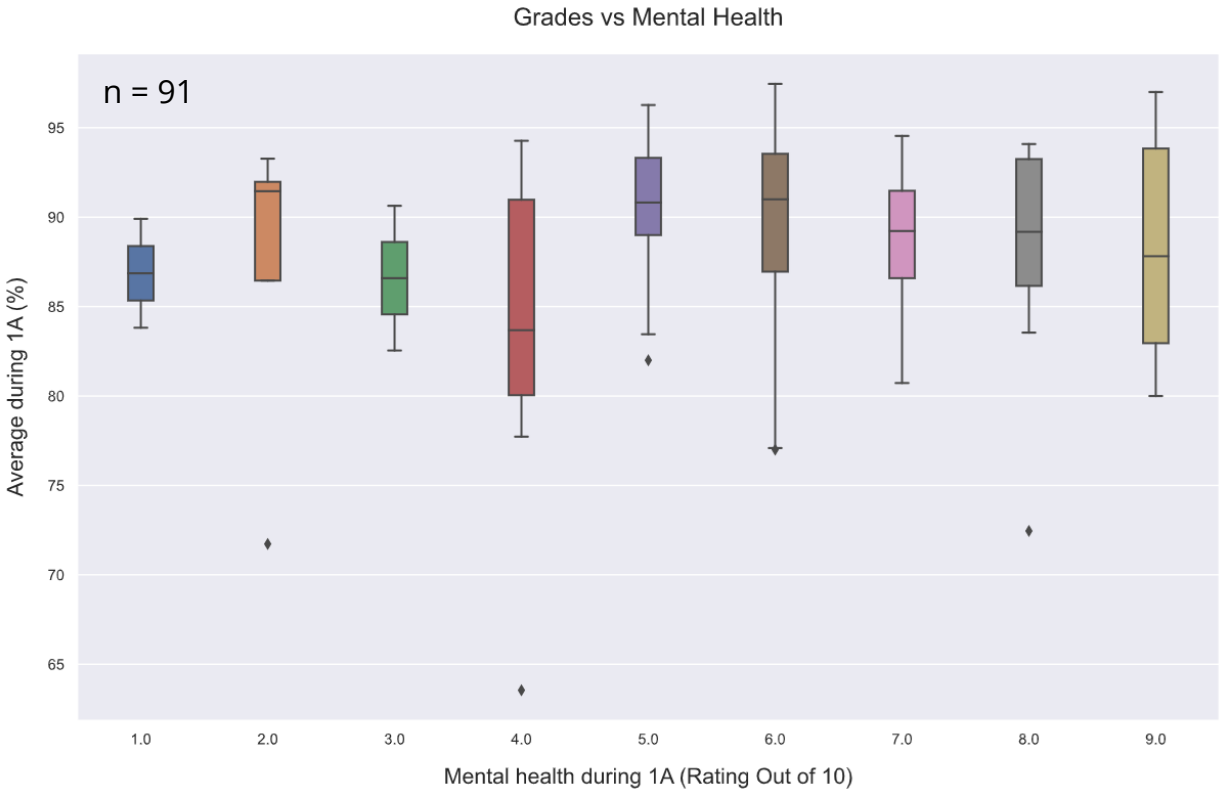


Mental Health VS Grades

People who rated their mental health greater or equal to a 5 out of 10, had a median average greater than 85%.

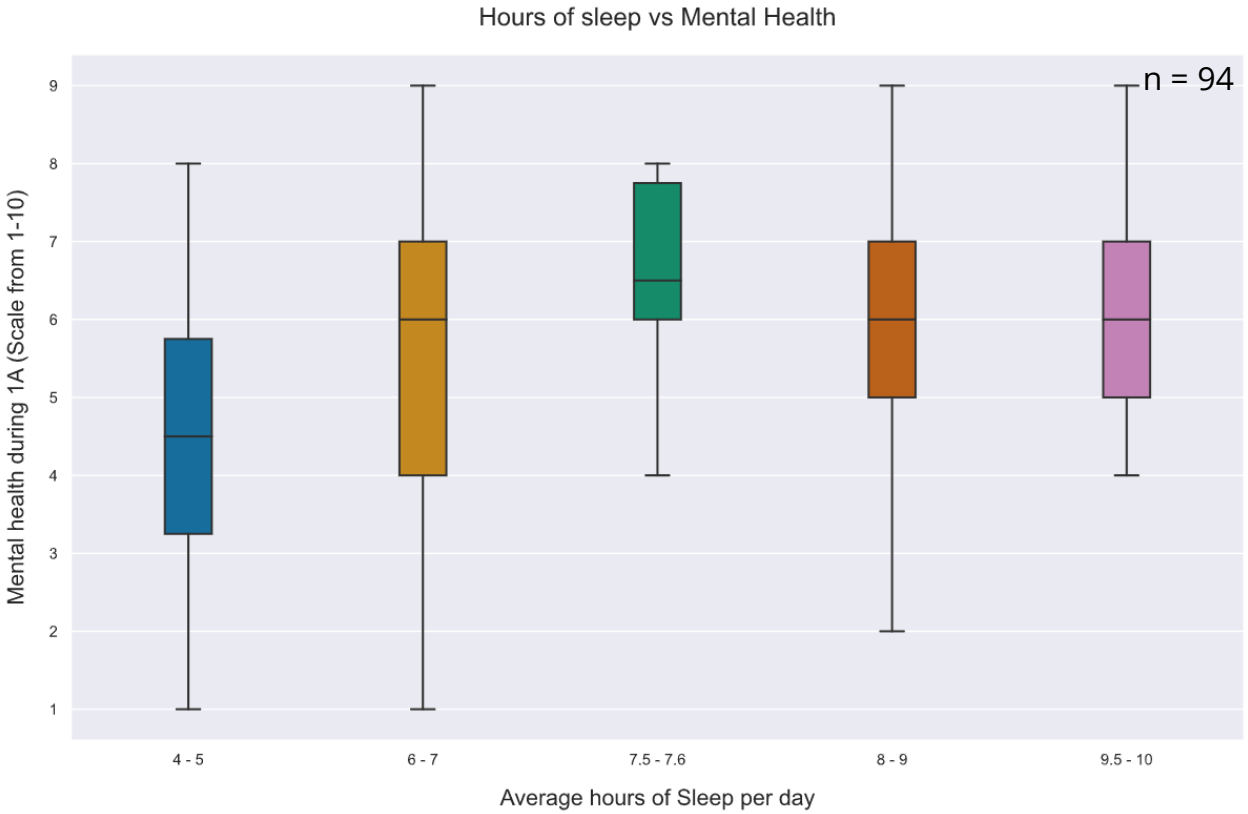
However, people who rated their mental health to be a 1-3 out of 10 also had a median average greater than an 85%.

Note: The number of people who rated their mental health in that range is less than those who rated their mental health a higher score.



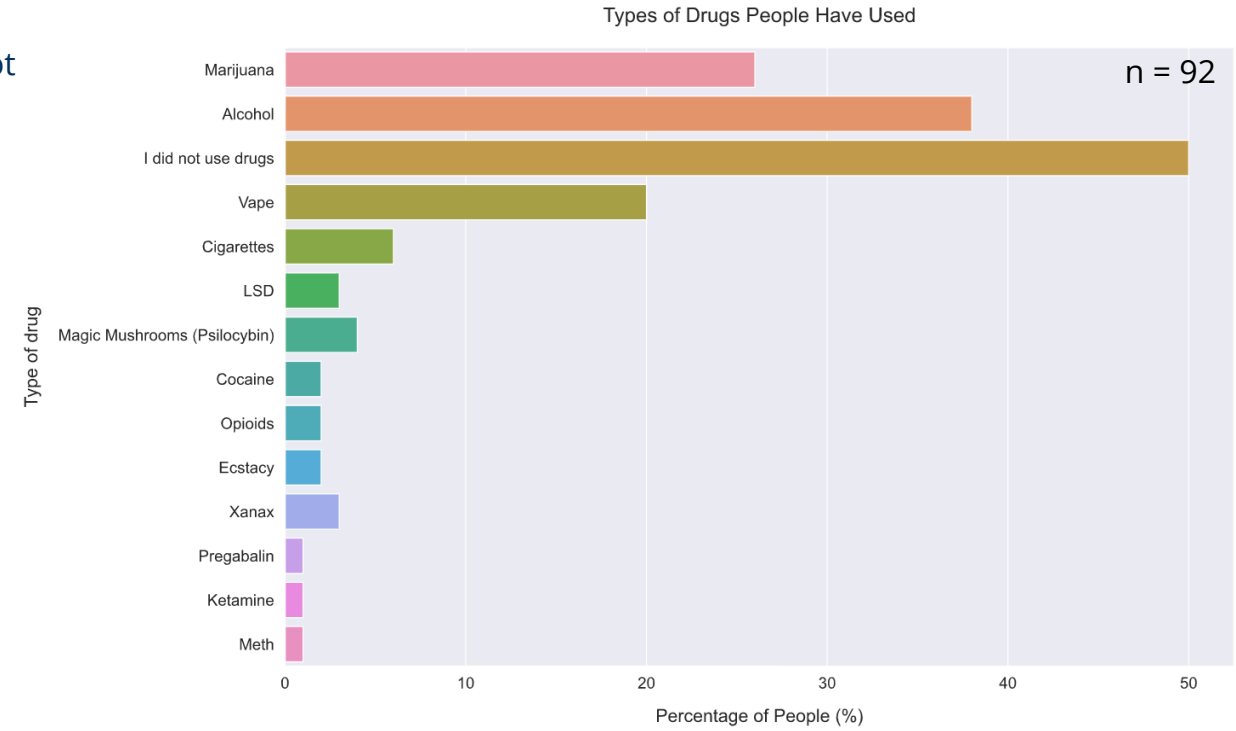
Mental Health VS Sleep

The number of hours of sleep does not seem to have an effect on mental health, as seen with the median mental health scores.

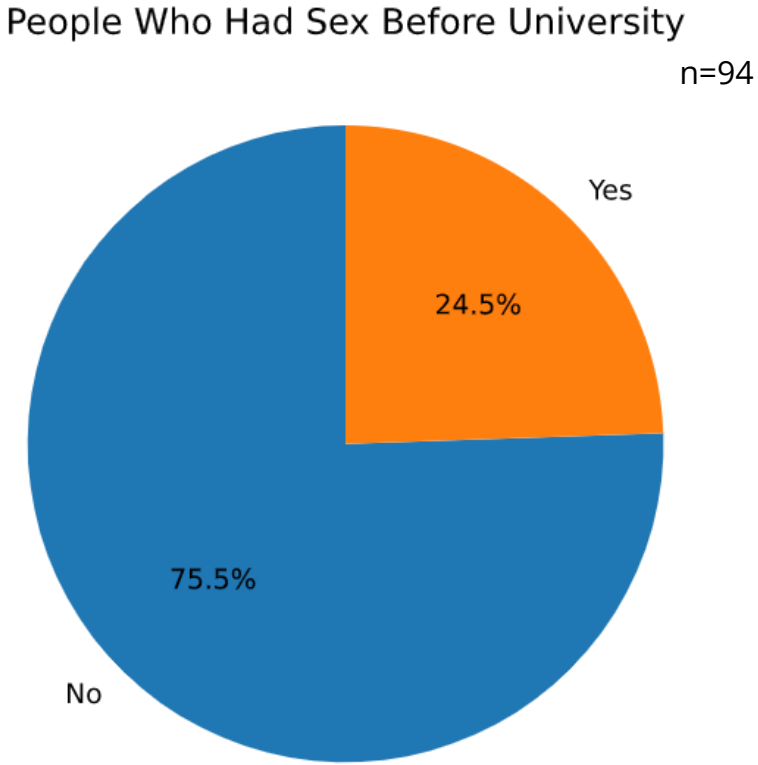


Types of Drugs Consumed

The majority of the cohort have not consumed recreational drugs.

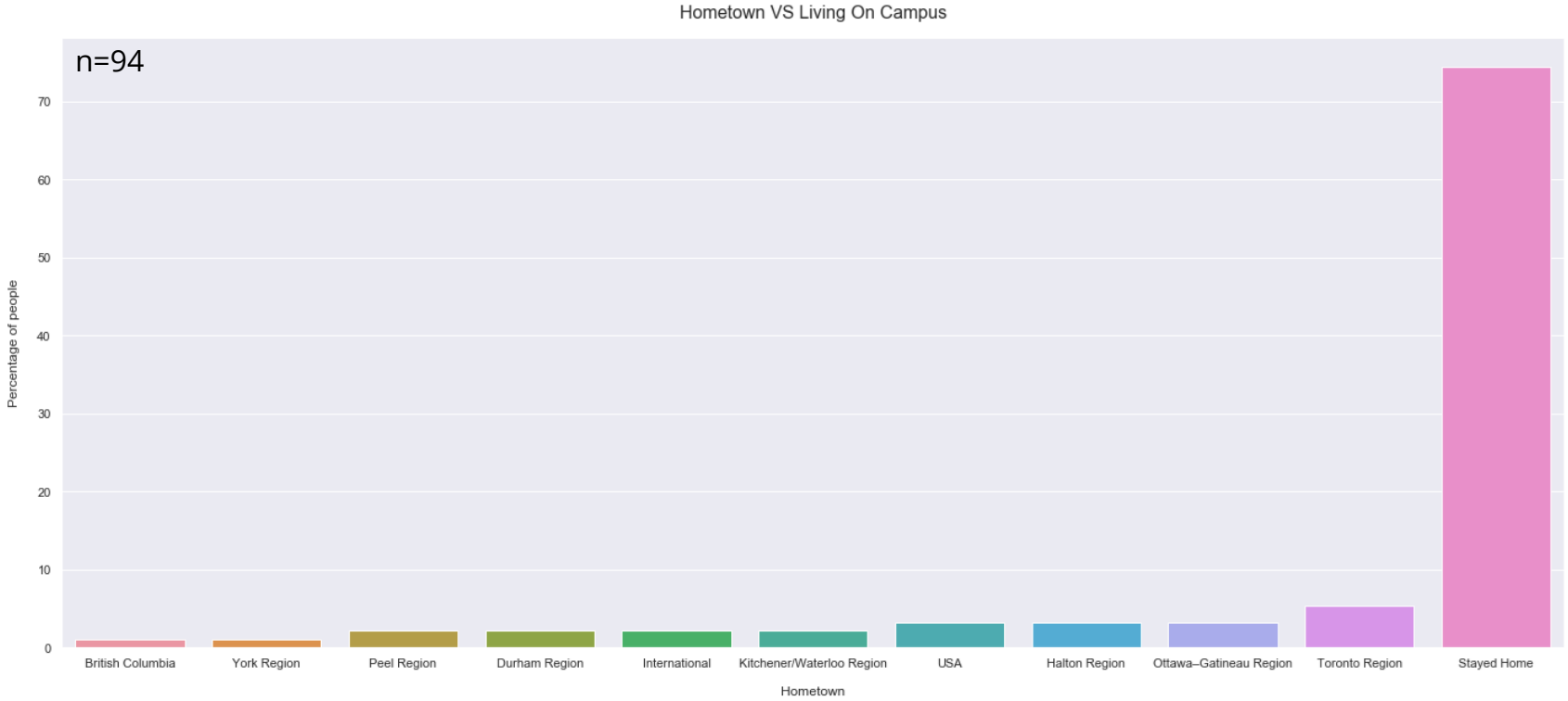


Virginity

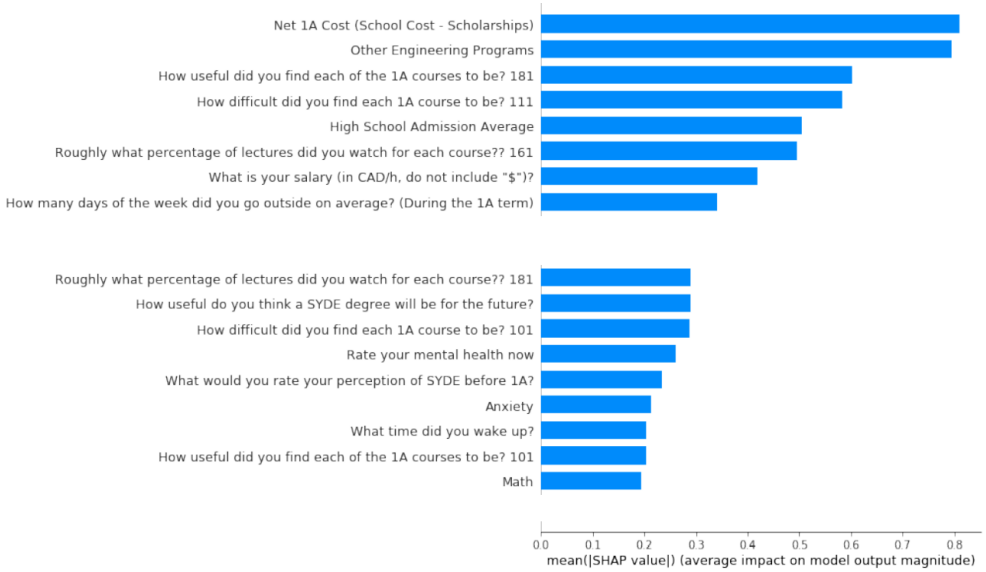


Moving To Campus VS Hometown

The majority of people who lived on campus were Torontonians. Due to the pandemic, most of the class (about 75%) stayed home.



MACHINE LEARNING



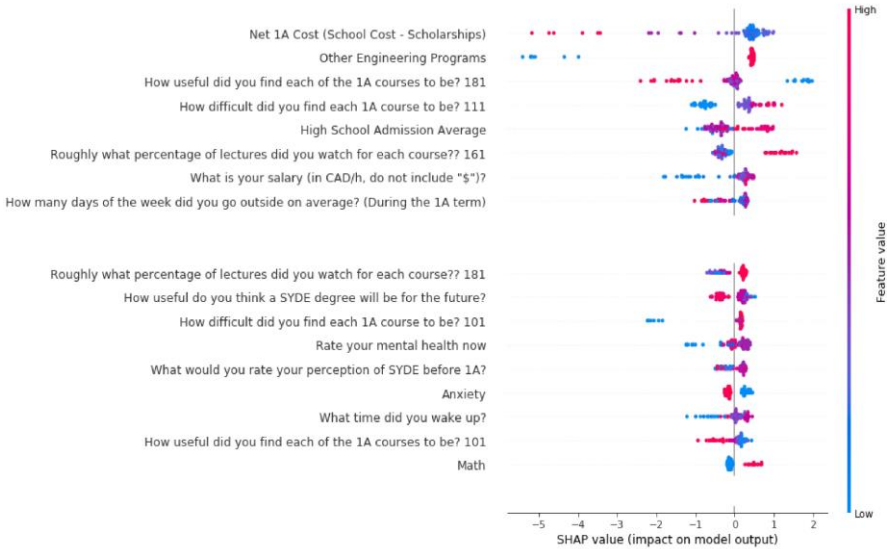
FACTORS THAT PREDICT ACADEMIC AVERAGES

FACTORS THAT PREDICT ACADEMIC AVERAGES

- A machine learning model was trained to predict SYDE 1A student averages based on most of the survey questions. After training the model, these were the features that had the largest effect on predicting student averages.

- The features near the top of this graph affected SYDE 1A student average predictions the most. These are only the top 20 features out of 261.

- Note: 3 features have been excluded to prevent singling out any specific groups. Also, the results may vary depending on when the model was trained since this machine learning model includes random elements.



FACTORS THAT PREDICT ACADEMIC AVERAGES

FACTORS THAT PREDICT ACADEMIC AVERAGES

- This graph is a continuation of the past bar graph on feature importance, and it shows **how** the past features affect SYDE 1A average predictions.

- Here are interpretations for the top 6 features:

  - High and medium-high *Net 1A Costs* predicted much lower averages; low and medium-low *Net 1A Costs* predicted slightly higher averages
  - Not applying to any *Other Engineering Program* other than SYDE predicted much lower averages, applying to *Other Engineering Programs* predicted slightly higher averages
  - Rating *SYDE 181* (Physics 1) as very useful predicted lower averages; rating *SYDE 181* as very useless predicted higher averages
  - Rating *SYDE 111* (Calculus 1) as very difficult predicted slightly lower averages; rating *SYDE 111* as very easy predicted slightly higher averages
  - In some cases, high *Admission Averages* predicted slightly higher 1A averages
  - Please refer to the appendix for more information on how to interpret the rest of this graph.

Factors That Predict Grades: Extra Info

The further left a point was, the more it predicted lower averages. Conversely, the further right a point was, the more it predicted higher averages. Points near zero (near the y-axis) did not affect the predictions much.

The colour of a point specifies if the point is a higher value or lower value for its respective row/feature. For example, red points in the ‘Net 1A Cost’ feature represent high costs, purple point represent medium costs, and blue points represent low costs.

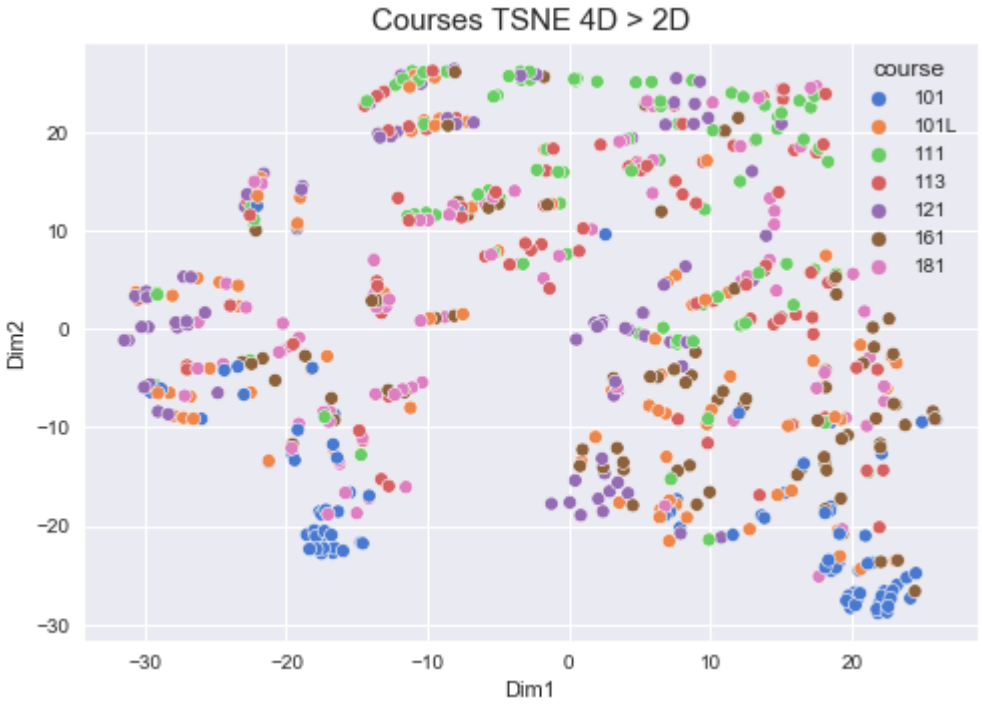
For a more in depth explanation, refer to: https://www.kaggle.com/dansbecker/advanced-uses-of-shap-values

Finding Similar Courses

To find similarities between courses, 4 features/dimensions related to courses (average, percentage of lectures watched, difficulty, and usefulness) were reduced to 2 dimensions and then graphed.

Similar courses should be clustered together in this graph.

Note: The next two slides continue the analysis in greater depth.

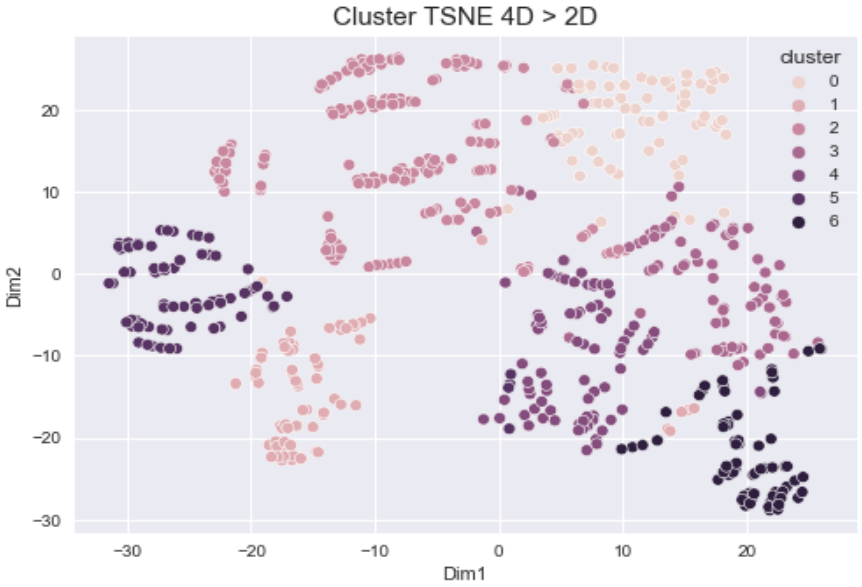


Finding Similar Courses

The initial 4 dimensional data was clustered into 7 clusters using a machine learning algorithm. This way, each cluster could be inspected for similar courses.

This graphs shows the same data points as the previous graph, but it highlights the cluster rather than the course.

Finally, each one of these 7 clusters was graphed individually while highlighting the courses in each cluster to identify similar courses (next slide).



Finding Similar Courses

Main Courses In Each Cluster (refer to SYDE opinion for each cluster below)

Cluster 0: SYDE 111, SYDE 113, SYDE 181

Cluster 1: SYDE 101, SYDE 181

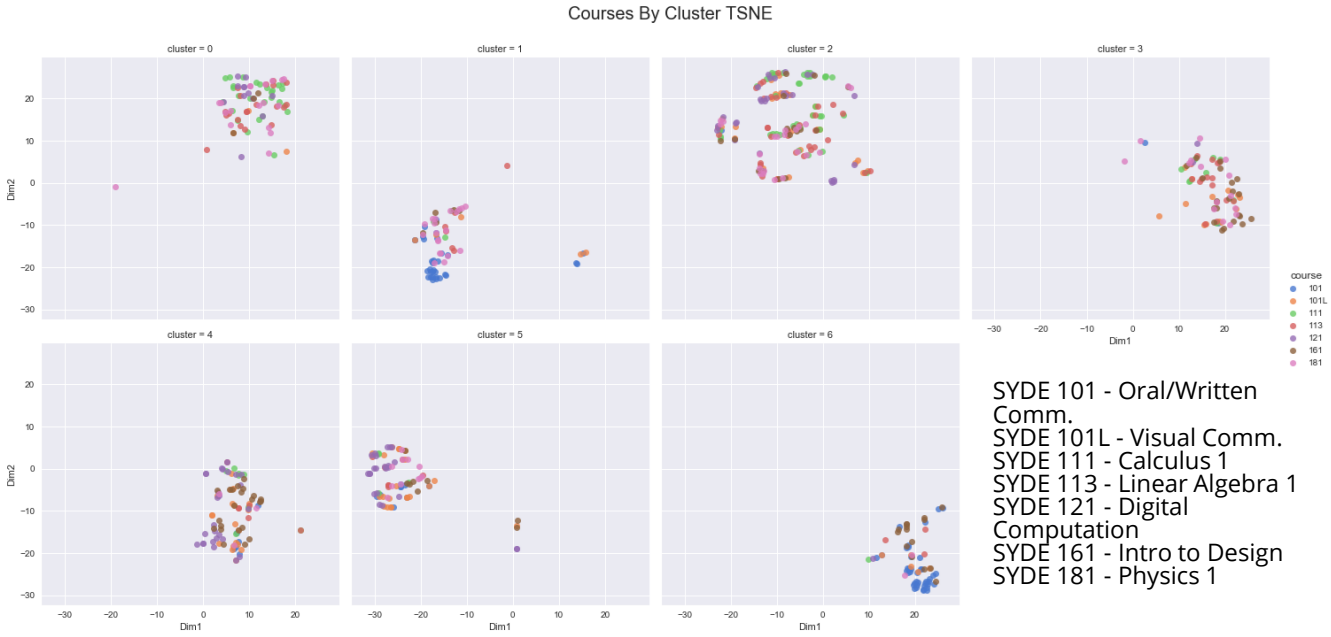
Cluster 2: Mix of all courses except SYDE 101

Cluster 3: Mix of all courses except SYDE 101 and SYDE 121

Cluster 4: SYDE 101L, SYDE 121, SYDE 161

Cluster 5: SYDE 101L, SYDE 121

Cluster 6: Mainly SYDE 101, some SYDE 161



SYDE 101 - Oral/Written Comm.
SYDE 101L - Visual Comm.
SYDE 111 - Calculus 1
SYDE 113 - Linear Algebra 1
SYDE 121 - Digital Computation
SYDE 161 - Intro to Design
SYDE 181 - Physics 1

SYDE Opinion

Cluster 0: Mainly contains Math/Physics courses - all of these courses contain mathematical elements
Cluster 1: Both courses seem to have many extreme values for one specific bin; 101 was rated 'easy' by 69% of respondents and 62% of people said they watched '100% of lectures' for 181. Additionally, neither of the courses was rated highly in terms of usefulness
Cluster 2/6: SYDE 101 was generally rated the easiest, most useless, had the 2nd highest grade mean, and 2nd lowest average percent of lectures watched; it was an outlier (didn't appear in cluster 2 and dominated cluster 6)
Cluster 3: SYDE 101 and 121 had the highest course means and medians; best courses academically. Since cluster 3 does not contain SYDE 101 and 121, this cluster may highlight courses with lower course means
Cluster 4: Creative courses where the focus was on building projects; each one of these courses was project/lab based
Cluster 5: These were both of the courses that Professor Igor taught (the only two courses taught by the same professor)

References

- [1] https://danielraymond.me/SYDE-1A-Data.pdf?fbclid=IwAR0f3lM9SSJ5uC9aZ7pzv4s4GNxlZtyKhmvvixFj9wlOFyyeGkyFc6Nzdp4
- [2] https://ndey96.github.io/syde_2019_class_profile.pdf
- [3] https://uwaterloo.ca/future-students/programs/systems-design-engineering
- [4] https://statistics.laerd.com/statistical-guides/pearson-correlation-coefficient-statistical-guide.php
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