UNDERSTANDING AND IMPROVING DIVERSITY AND INCLUSIVE CULTURE IN WPI COMPUTING DEPARTMENTS AND PROGRAMS

An Interactive Qualifying Project submitted to the faculty of
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requirements for the Degree of Bachelor of Science Submitted

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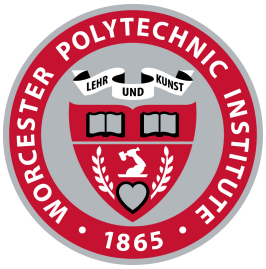

ABSTRACT

The goal of the project was to improve DEI practices in computing departments and programs at Worcester Polytechnic Institute with a particular focus on the Computer Science Department. The project expands on previous research performed at WPI and similar institutions with 84 survey responses and several student and professor interviews capturing the overall experience of individuals in the field of computing at the school. The final deliverable for the project was a set of recommendations aimed at improving DEI practices and other aspects of computing culture to ensure students have a supportive, welcoming, and exciting experience.

ACKNOWLEDGMENTS

The team wants to thank the following individuals for their support and contributions to the project, without whom the project would not have been as successful.

Our project advisor, Professor Gillian Smith, was instrumental in making our work successful. Their resources, encouragement, and support helped us to complete goals in a timely manner.

The DataBuddies project leads for granting us access to their collected data aimed at improving DEI in the CS Department. This information gave the team a more holistic view of trends throughout the last few years that made our data analysis more informative.

Professor Shue and the other department heads, program leads, and professors who distributed the survey and encouraged students to participate.

Professors and students who contributed to the project by filling out the survey and answering our interview questions.

EXECUTIVE SUMMARY

The goal of the project was to identify issues with current diversity, equity, and inclusion (DEI) practices in computing departments and programs at WPI to encourage a more welcoming, supportive, and encouraging environment for all students. Building this environment will lead to increased student confidence and success which is important to create a diverse, innovative workforce in the future. Improving DEI practices will not only help students in marginalized groups to succeed within the field of computing, but all students. After conducting a survey and several interviews, the team created a list of recommendations for students, faculty, computing departments, and WPI as a whole.

Main Issues Identified

Through the survey and interviews conducted with students in computing majors, a few major issues were identified as negatively impacting student experience:

1. Lack of community and a feeling of isolation among students not involved with student organizations already
2. Need for student organization support and physical and online community spaces for peers and faculty members to connect in a casual member
3. Underutilized advising program and lack of official mentorship program for all computing students leading to less amounts of student support
4. Problems with collaborative work, failing course infrastructure, and disconnected course progression causing student frustration and stress

Recommendations

As a final deliverable, the team created a series of recommendations for groups on-campus to collaborate and make changes.

Recommendations for Students

1. Create a general non-professional computing student organization to create a sense of community among all CS students and make a forum for casual discussion and connection-building
2. Create an LGBTQ+ centered student organization to uplift members of this marginalized group and increase students' sense of community
3. Improve student organizations through increased advertisements and collaborations among clubs and departments to increase retention and engagement throughout the entire academic year
4. Restructure the current CS Discord server to be a welcoming, informative resource and space for students, teaching staff, and faculty to connect in a non-professional setting

Recommendations for Faculty

1. Reorganize research opportunities, when possible, to be welcoming to students with less research experience and advertise these opportunities to students through announcements
2. Develop a student partner pairing system with assistance from students for more successful and fulfilling collaboration experiences
3. Reach out to students first to initiate the advising process and be active throughout the advising process; participate in the creation of a student-advisor matching program

Recommendations for Computing Departments

1. Redesign course transition requirements to ensure students are prepared for coursework and create a semi-universal infrastructure for teaching classes and for virtual machine setup to make the start of courses more smooth
2. Implement a CS tutoring system for introductory courses with inspiration from the Math Department to make a centralized resource for course help
3. Further develop the current CS Department peer mentorship program to include upperclassmen (not just freshmen) and work with other computing departments and programs to implement their own mentorship programs
4. Improve Fuller Commons as a common space for computing majors by collaborating with student organizations on events in the space and working to undo the current perceptions of the area as for coursework only
5. Increase teaching staff and faculty diversity to better represent the student body
6. Continue conducting studies and interviews through IQPs and other projects so that the practices of each department are in line with what students need

Improving the Experience of Disabled Students

The team also wanted to mention some potential solutions for the issues disabled students face, for collaboration from students, faculty members, departments, and WPI as a whole:

1. Make recorded lectures through Echo360 or Zoom mandatory and ensure subtitles and transcripts are available if needed
2. Work with the OAS and SDCC to address student needs in a holistic way

AUTHORSHIP

Both team members contributed equally to writing, researching, collecting data, and editing for the project.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION

Computer Science, as a discipline and profession, has several issues with representational diversity and an inclusive culture that negatively affect students. Nationwide, the majority of undergraduate degrees in Computer Science are awarded to cisgendered white men, and there are problems with representation and bias toward people in marginalized societal groups within computing as a whole: women, LGBTQ+, BIPOC (black, indigenous, and people of color), and disabled people[1]. As software like facial recognition and fields like Cyber Security emerge, creating a diverse, confident, and capable workforce through computing education is essential.

The National Center for Education Statistics conducted studies across postsecondary institutions in the United States and found that of those receiving degrees for computer and information services, nonwhite students and students identifying as female were in fewer numbers than white students and students identifying as male respectively, and this disparity increased when considering nonwhite females versus white males[1].

There exist many examples in which computing majors are outliers compared to the general student population. In 2019, 58% of the student population identified as female, but within the Computer Science field, only 21% identified as female. Worcester Polytechnic Institute reflects these statistics in enrollment numbers. In the same year, WPI had a 36% female enrollment rate but 24% enrollment in computing-related majors[2]. Gender minorities outside of the binary were not even recorded on a school-wide level, and this is consistent with the rest of

[1] National Center for Education Statistics. (n.d.). Digest of Education Statistics - Advance Release of Selected 2021 Digest tables. https://nces.ed.gov/programs/digest/2021menu_tables.asp

[2]WPI Institutional Research. (October 2022). Enrollment. Office of Strategic Initiatives and University Analytics. Worcester Polytechnic Institute. https://public.tableau.com/app/profile/wpi.institutional.research/viz/Enrollment_15718046316670/Enrollment

the United States. White students made up 54% of the student population in the United States[3] and 49% of the computing major student body[4]. Meanwhile, students identifying as white made up 52% of WPI's computing major population. While these statistics outperform the general WPI student body which was 56% white in 2019[5], white students still make up the majority of the major.

Several marginalized groups do not have the opportunity of being represented in nationwide data focused on majors and programs, so it is difficult to compare the general student population with the computing student population. This is particularly true of the general LGBTQ+ community and the disabled community. While statistics on students with disabilities have been gathered by a variety of organizations, the most recent statistic found that 14.5% of students nationwide identified as having a disability, with no data available on the students' majors.[6]

Other universities across the United States are working to improve the experiences of marginalized groups by targeting two areas in computing-related departments: culture and curriculum. Through this system, representation and a sense of community for these groups in the departments were established in some universities[7]. However, some universities attempted to

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[3]National Center for Education Statistics. (n.d.). Digest of Education Statistics - Advance Release of Selected 2021 Digest tables. https://nces.ed.gov/programs/digest/2021menu_tables.asp

[4]National Center for Education Statistics. (n.d.). Digest of Education Statistics - Advance Release of Selected 2021 Digest tables. https://nces.ed.gov/programs/digest/2021menu_tables.asp

[5] WPI Institutional Research. (October 2022). Enrollment. Office of Strategic Initiatives and University Analytics. Worcester Polytechnic Institute. https://public.tableau.com/app/profile/wpi.institutional.research/viz/Enrollment_15718046316670/Enrollment

[6]Soria, K. M. (2021). Supporting undergraduate students with disabilities: A focus on campus climate and sense of belonging. National Center for College Students with Disabilities. https://www.nccsdonline.org/uploads/7/6/7/7/76772 80/supporting_undergraduate_students_with_disabilities.pdf

[7]Peckham, J., Harlow, L. L., Stuart, D. A., Silver, B., Mederer, H., & Stephenson, P. D. (2007). Broadening participation in computing. ACM SIGCSE Bulletin, 39(3), 9–13. https://doi.org/10.1145/1269900.1268790

implement solutions that only fixed certain issues, while neglecting others that resulted in a continued feeling of alienation by these groups[8].

WPI must aim to improve diversity, equity, and inclusion (DEI) practices while avoiding ineffectual or harmful changes which occurred in other schools. Though WPI has previously conducted an assessment on female representation in the Computer Science Department, diversity includes much more than gender, and the CS culture touches more than just the department itself through coursework inclusion in other majors, joint events, and student organizations. The team worked to develop an understanding of the experiences of students in computing majors in focus departments, being Bioinformatics and Computational Biology (BCB), Computer Science (CS), Cyber Security (CyS), Data Science (DS), Interactive Media and Game Development (IMGD), and Robotics Engineering (RBE) at WPI to create a more inclusive, supportive, and welcoming environment for all students through recommendations based on practices of other universities, current WPI practices, and data on student experience.

[8] Metcalf, H. E., Crenshaw, T. L., Chambers, E. W., & Heeren, C. (2018). Diversity across a decade. Proceedings of the 49th ACM Technical Symposium on Computer Science Education. https://doi.org/10.1145/3159450.3159497

2 BACKGROUND

2.1 HISTORY AND OVERVIEW

WPI was originally founded in 1865 in Worcester, Massachusetts as an all-male institution focusing on engineering and technology. Women were first allowed to attend in 1968 under the guidance of the school's president, Harry P. Storke. In 1919, WPI welcomed its first black student, Naudin Oswell[9]. Since then, WPI has worked to increase representation and support of groups traditionally marginalized in STEM fields through initiatives like the Connections program in 1993, and Louis Stokes Alliance for Minority Participation (LSAMP) Scholar Program that was overhauled into the current program in 2019. The Connections program helps students of color, first generation students, and LGBTQ+ students by providing mentorship, social activities, and more opportunities right before student orientation to assist underrepresented students in integrating with the WPI community. The LSAMP Scholar Program supports underrepresented students of color by providing a scholarship and a community to join.

The CS Department originally started in WPI's Gordon Library in the mid 1960's, eventually moving into several offices in Atwater Kent in 1980. Though computing courses are currently present in all buildings on-campus, Fuller Labs is often regarded as the 'computing hub' on-campus, being where most CS faculty members are present and where computing-related events are held. Constructed in 1990 and named after George F. Fuller, the building initially served as the center for all subjects information technology-related, expanding to include the IMGD Department. The building is home to WPI's networking infrastructure. Fuller Labs has 4 academic classrooms, many faculty offices, several student workspaces, and a common area called Fuller Commons for students to gather. Fuller Commons was added as a student space on

[9]Baron, A. (2021, February 23). The Odyssey of Naudin Oswell, WPI's first Black graduate. WPI Journal. Retrieved January 23, 2023, from https://wp.wpi.edu/journal/articles/the-odyssey-of-naudin-oswell-wpis-first-black-graduate/

recommendation of a previous IQP analyzing female inclusion in the CS Department in 2017[10]. The building is equipped with accessible bathrooms, doors, and an elevator.

The gradual expansion of the CS Department into its own dedicated building is indicative of WPI's mindset for growth of computing-related majors. This is also seen in the other computing departments on-campus. Many programs and departments have moved to the newly-constructed Unity Hall building. The DS program, established in 2015 as an undergraduate program and prior as a master's program, resides on the third floor. The RBE Department, created in 2007 as an undergraduate program, is mainly located on the first floor of the building being almost entirely robotics labs for students and professors to collaborate on long-term projects. BCB, starting out in 2011, also resides in the building. The CyS concentration within CS does not yet have its own building, but has been growing in student numbers. The recent introduction of the MS program has been successful in steady growth. With the growth of computing as a field, it is important to view WPI as part of the larger United States to understand how the school's metrics compare to those in the larger computing community.

Nationwide, marginalized groups have historically been underrepresented in computing fields, despite computing major numbers increasing drastically each year. The number of computing-related degrees awarded has increased almost 120% between 2000 and 2020. Despite this general increase in computing interest, the percentage of women receiving corresponding degrees decreased from 28% in 2000 to just 21% in 2020[11]. Additionally, a study in 2017 found that only around 8% of computing majors surveyed identified as having a disability[12]. No

[10] Wallace, H., Keeley-DeBonis, B., Hammer, C., & LaPierre, K. (2017). Attraction and retention of women in computer science at Worcester Polytechnic Institute. Worcester: Worcester Polytechnic Institute.

[11]National Center for Education Statistics. (n.d.). Digest of Education Statistics - Advance Release of Selected 2021 Digest tables. https://nces.ed.gov/programs/digest/2021menu_tables.asp

[12] Data Buddies Project. (n.d.). Data Buddies Survey [Data set]. Computing Research Association Evaluation. https://cra.org/cerp/data-buddies/

statistics were found for LGBTQ+ students in computing nationwide. Even in the last few years, maintaining data collections to understand DEI issues has been lacking with several marginalized groups in computing.

Students often begin their computing journey in high school, and representation issues here are expressed in college as well. Several high school programs incorporated computing-related courses within their academic year to match the demand for computing skills to be taught. From 2018 to 2021, there has been an increase from 38% to 53% of United States high schools offering computing-related courses. However, the high schools with these programs are more likely to be part of wealthy white communities, resulting in marginalized groups lacking exposure to computing topics[13]. In Massachusetts, only 28% of students enrolled in these high school computing courses were female, as of 2022[14].

This translates to women being less confident or well-equipped to take college-level Advanced Placement (AP) tests. While women made up 55% of students taking the exams overall, they made up only 35% of the Computer Science Principles or Computer Science A tests in 2020, with less than 1% of those taking the tests identifying outside of the gender binary[15]. While this is an increase from previous years, with the first online-accessible records showing 14% of tests being taken by women in 2002. Even before arriving at college, female students and students of color have less opportunity to engage with computing topics to prepare them for university. Thankfully, many colleges including WPI started pre-collegiate outreach programs to

[13] Klein, A. (2021, November 5). More than half of high schools now offer computer science, but inequities persist. Education Week. Retrieved January 23, 2023, from https://www.edweek.org/teaching-learning/more-than-half-of-high-schools-now-offer-computer-science-but-inequities-persist/2021/11

[14]Advocacy Coalition. (n.d.). Massachusetts. 2022 State of Computer Science Education. https://advocacy.code.org/state-handouts/Massachusetts.pdf

[15]College Board. (2020.) Program Summary Report [Data set]. https://reports.collegeboard.org/media/pdf/Program-Summary-Report-2020_1.pdf

engage marginalized groups in STEM-based activities to inspire interest and confidence in computing and other science topics.

CS student numbers have increased dramatically at WPI, currently maintaining a place as the largest major on-campus, surpassing Mechanical Engineering in 2020. In 2000, just 571 students were placed in the CS program (the only computing major available). 92% of students were male and 79% of students were white, compared to the school's 77% male population and 81% white population as a whole, showing that computing leaned more towards men even exceeding the general population percentages. While there are now more computing majors, numbers collected from 2021 show that this problem still remains. Though WPI as a whole increased female enrollment to 37% (compared to 23% previously), only 26% of computing majors were women (compared to 8% previously). Computing majors also have chronic underrepresentation of students of color, with the general student body consisting of 60% nonwhite students and computing majors having only 48% in the same year[16]. Marginalized groups often are not at the same level of representation in computing majors as they are in WPI as a whole, a problem faced by these departments throughout their existence.

Since 2013, the CS Department has participated in the Data Buddies survey project, a program designed to provide institutions with the ability to better understand marginalized group retention and experience while contributing to larger datasets to represent the United States. In the first year, 23% of students in computing fields identified as having a disability. 23% of students identified outside of the label of heterosexual. Gender, sexual orientation, or race

[16]WPI Institutional Research. (October 2022). Enrollment. Office of Strategic Initiatives and University Analytics. Worcester Polytechnic Institute. https://public.tableau.com/app/profile/wpi.institutional.research/viz/Enrollment_15718046316670/Enrollment

statistics were not reported in this or any subsequent years. In a 2021 survey, 33% of students surveyed reported having a disability, showing increased representation at the department level[17].

While WPI's computing departments and programs have representation better than that nationwide in some instances, the school-level statistics show a clear need for improvement to create a diverse computing community. To address these diversity concerns in the growing computing field, organizations like WPI have regularly made efforts to check in on student experiences through surveys and to enable students in creating community spaces.

2.2 CURRENT PRACTICES

Since its creation in the early 90s, the Office of Diversity, Inclusion, and Multicultural Education (ODIME), previously known as the Office of Multicultural Affairs (OMA), has worked to promote diversity, equity, inclusion, and belonging through training, learning experiences, and WPI initiatives. It has not only been a safe space for marginalized students but also has been a place to explore resources related to the student experience. The OMA regularly hosts events to connect students, faculty, and staff members of diverse backgrounds.

Many departments in the computing field at WPI, including CS and DS, have established DEI committees to better inform best practices in their respective departments. These committees consist of faculty and staff members collaborating to analyze and improve current practices. Faculty members are often involved in work in multiple departments and can share perspectives from multiple areas in computing. The CS DEI Committee is integral to the launching of the annual Data Buddies survey. Other computing departments often conduct their own internal surveys to determine student perspectives and experiences.

[17]Data Buddies Project. (n.d.). Data Buddies Survey [Data set]. Computing Research Association Evaluation. https://cra.org/cerp/data-buddies/

To improve the experience of first-year students, the CS Department started a peer mentorship program connecting freshmen with upperclassmen for their first semester of school. Mentors were selected by the CS Department and were sent emails asking to participate in the program and potential mentees were contacted through general department advertisements. Both filled out surveys discussing interests in CS, extracurricular activities, and more so that pairings would be successful. Mentors and mentees arranged meetings on their own time and two larger meetings with the entire cohort of students were conducted to create a larger support circle for first-year students.

Several student organizations at WPI have given students opportunities to connect with computing outside of coursework. Women find support in groups like Women in Cyber Security, Women in Computer Science, and Women in Robotics Engineering. These clubs aim to elevate women and nonbinary students by connecting them with peers and industry professionals and discussing topics related to women in computing. The Diversity in Games club supports students identifying as a member of one or more marginalized groups to explore their interests in IMGD. Professional clubs like Association for Computing Machinery, Rho Beta Epsilon (the RBE honor society), and Upsilon Pi Epsilon (the CS honor society) seek to connect their members with industry professionals and are involved with computing-related community service work on campus. The Data Science Club, the Bioinformatics and Computational Biology Club, the Cyber Security Club, and the International Game Developers Association let students dive into their major-related interests and build a community to support each other.

2.2.1 Communication Methods

Computing students at WPI connect with peers in these organizations mainly through Microsoft Outlook, Discord, and Slack. While many student organizations have used Slack in the

past, many seem to have moved towards Discord as a primary communication method, especially those firmly rooted in the CS community. Students communicate through direct messages, general servers, class-based servers, and major-related servers. These organizations send regular Outlook emails to keep members not involved with Discord updated. Slack and Outlook are still implemented as communication methods by computing departments for faculty discussions and announcements.

WPI and its computing departments are working towards creating a more diverse, equitable, and inclusive community through its self-analysis and student organizations. However, it is essential for these departments to understand the successes and failures of DEI programs at other universities to see what can be adopted for the benefit of marginalized students internally.

2.3 OTHER UNIVERSITY FINDINGS

Other universities in the United States have been unrolling their approaches to improving the computing-related major experience with regard to marginalized groups with varying levels of success. These approaches usually fall into two categories, curriculum and culture. By analyzing the ideas and programs discussed by other universities, a robust idea of current problems with practices can be gained.

2.3.1 Curriculum-Based Changes

The University of Florida experimented with limiting negative experiences for women in the CS Department through curriculum innovations. The school offered an experimental introductory CS course, designed for only women to take, and see how results varied between this all-women's CS1 course and the general CS1 section. CS1 serves as an introduction to basic programming concepts that prepare students for higher-level courses later on. They cited gender

stereotypes and lack of role models and outside support as underlying reasons to the problems women usually experience in CS, which pertain to lower grades and lacking a sense of belonging. The all-women's class was extremely successful, reporting improvements in enjoyment and inclusion between the course and the general course, with specifically stronger social connections between classmates, higher confidence in remaining a CS major, and a greater sense of community in the course. The study recommended that all-women's course sections, labs, and clubs should be further looked into, as they might help to create similar effects as described above[18]. Other universities such as the University of Virginia have implemented similar introductory programming courses based on marginalized group status and skill level to ensure students have a supportive and welcoming first experience with computing at the university level[19].

The University of Rhode Island explored interdisciplinary studies and programs as a way to increase retention and understanding within computing-related majors. Exploring applications to society, especially those pertaining to diversity-related issues, was found to attract and retain students in marginalized groups more than standard course material. Incorporating practicum projects with a less technical focus than traditional curriculum, with a focus instead on theoretical frameworks, was also successful in drawing a large group of students with diverse backgrounds. Students in marginalized groups also frequently participated in the Research Experience for Undergraduates program sponsored by the National Science Foundation. Students that engaged with the programs continued on to graduate research programs, and students in

[18]Ying, K. M., Rodríguez, F. J., Dibble, A. L., Martin, A. C., Boyer, K. E., Thomas, S. V., & Gilbert, J. E. (2021). Confidence, connection, and comfort. Proceedings of the 52nd ACM Technical Symposium on Computer Science Education. https://doi.org/10.1145/3408877.3432548

[19]Cohoon, J. P. (2007). An introductory course format for promoting diversity and retention. ACM SIGCSE Bulletin, 39(1), 395. https://doi.org/10.1145/1227504.1227450

non-STEM majors took on additional computing-related studies.[20] These initiatives worked to build confidence, community, and understanding of course material which in turn helped with retention in students' respective computing-related majors.

At the University of Illinois, there was a ten-year case study conducted to analyze the deployed solutions designed to address problems with the CS Department. It was split into two phases: the first phase, which occurred in 2007, would research and identify problems with the department overall. The problems were identified as students' sense of belonging in the department was lacking and that students believed that the department did not value teaching and instead valued research projects. The second phase, which occurred in 2017, ten years later, assessed the steps the department had taken to address these problems and discovered how much these changes improved student diversity.

The recommendations made initially in 2007 were to "facilitate more interactions between student and faculty, improve quality of teaching, increase early research opportunities, and create multiple and diverse mentoring opportunities." In response to this, the department made changes to require formal teaching requirements for teaching Ph.D. students, improve advising policies for undergraduates, and be more rigorous with instructors, having all introductory courses assigned to faculty who primarily were focused on teaching over research. Students were each assigned a faculty mentor they were required to meet with before course registration with the goal of having better student-faculty relationships while giving students advice on major-based specializations and other opportunities to pursue while at school.

As a result of these policies, teaching quality overall increased, with students being more receptive to their professors' teaching style. Many students understood excellent teaching as an

[20]Peckham, J., Harlow, L. L., Stuart, D. A., Silver, B., Mederer, H., & Stephenson, P. D. (2007). Broadening participation in computing. ACM SIGCSE Bulletin, 39(3), 9–13. https://doi.org/10.1145/1269900.1268790

unquestionable part of the classroom experience. However, the mentorship program did not work well, with students only meeting with their mentors to fulfill the requirement needed to register for courses. These systemic changes did not necessarily improve many of the diversity problems that were found in the first phase. When asked about feeling successful at University of Illinois, many students' responses were largely linked to their demographic groups. Several students cited how their gender, race, or personal interests tended to alienate them from the general student population, or helped them fit into the "typical CS student" role. For students fitting into this role, they often reported this was because they fit into its stereotypes (white, male, having programming experience before college, etc.). Some students reported feelings of imposter syndrome from a lack of the supposed giftedness that other students had and a distinct lack of connection to the department because of it. Most students feeling this identified with one or more marginalized groups.

Researchers created recommendations for UIllinois to follow to ease feelings of imposter syndrome and isolation. The first recommendation was to create a culture that accepts and uplifts the lessons learned from failure instead of focusing on giftedness, which aimed to relieve imposter syndrome and remove the idea of the "typical CS student." The other recommendations served to improve the faculty mentorship program by training faculty members on the importance of student-faculty relationships in relieving isolation and making sure they are well equipped to be successful mentors[21]. The multi-step approach the university took in implementing DEI policies was important to their ultimate success, as had they only put in place the first round of practices without consulting students later on, its ineffective policies would have continued without actually improving student experiences.

[21]Metcalf, H. E., Crenshaw, T. L., Chambers, E. W., & Heeren, C. (2018). Diversity across a decade. Proceedings of the 49th ACM Technical Symposium on Computer Science Education. https://doi.org/10.1145/3159450.3159497

2.3.2 Culture-Based Changes

The University of Virginia studied diversity training for computing departments' staff and faculty to understand how language and activities affect the experience of participants in the training. The research delivered guidelines and warnings on how to conduct diversity training, as conducting effective diversity training is important to improving the experience of students, faculty, and staff members in computing departments and programs. A few recommendations are related to generalizing groups of people, particularly when referring to majority privilege. The paper mentioned that often when describing participants as privileged due to group membership, cognitive dissonance was observed, leading to some participants no longer paying attention to the training, so the paper recommended presenters use the idea of having more resources rather than being privileged for shorter presentations in which the idea of privilege cannot be fully-explored.

To further avoid cognitive dissonance in participants, the university looked at how their current training framework could be improved to build on ideas before adding diversity to the conversation, as it was common for participants to have strong reactions to the word "diversity" when it was used during training. Working initially with a familiar topic, like meeting a new person, and then transitioning into concepts like first impressions and how they relate to diversity was recommended as a more tangible, understandable, and relatable method. While these and other recommendations were not tested in an isolated environment as of yet, these will most likely increase the effectiveness of training models to ensure that faculty and staff members understand the necessity of DEI practices and their role in making sure they are successful[22]. Changing how faculty and staff think of DEI is essential to creating a more inclusive culture for

[22] Tychonievich, L., & Cohoon, J. P. (2020). Lessons learned from providing hundreds of hours of diversity training. Proceedings of the 51st ACM Technical Symposium on Computer Science Education. https://doi.org/10.1145/3328778.3366930

all people in computing-related departments while providing a way to express ideas for change when DEI issues are encountered.

The University of Rhode Island, discussed earlier, also implemented cultural changes in its computing majors to create a welcoming space for marginalized groups as part of their multifaceted approach to positively changing marginalized students' experiences. The study emphasized using interactional components in the cultural change so students, staff, and faculty members could work with materials and contribute to conversations. For example, the creation of student organizations outside of the classroom and the creation of brief biographies of individuals in marginalized groups succeeding in computing fields for display on department websites are examples of culture-based approaches meant to encourage interaction with materials and community members. Changing the culture within the classroom and outside of it are both important to a successful DEI policy in computing-related departments[23].

UMass Amherst conducted a study following women in engineering disciplines throughout their tenure at the university and found that peer mentorship intervention in the first year of education significantly contributed to limiting feelings of imposter syndrome and creating a better sense of belonging to the larger engineering community. Peer mentors were selected by the researchers and sent emails which were either accepted or denied. Upon acceptance, mentors were enrolled in a training program to better understand their role and how to be effective mentors to their mentee cohorts. Mentors were both men and women. The mentees were all women and were split into groups of 1-5 and assigned a mentor. A control group of women without a mentor were also monitored.

[23]Peckham, J., Harlow, L. L., Stuart, D. A., Silver, B., Mederer, H., & Stephenson, P. D. (2007). Broadening participation in computing. ACM SIGCSE Bulletin, 39(3), 9–13. https://doi.org/10.1145/1269900.1268790

The study found that women with female mentors had better levels of confidence in their skills, better retention in their majors, and more of a sense of belonging to their respective engineering communities when compared with the control group and with women who had male mentors. Though women with male mentors showed less of a decline in self-efficacy and belonging than those with no mentor, women mentors were shown to be the most effective in positively impacting the quality of experience for the studied women in engineering.[24] Motivation, confidence, and belonging are all important to the retention of students within their majors. While this study did not look at computing-related majors specifically, engineering as a whole suffers from similar problems that computing does, like imposter syndrome, stereotyping, and a lack of sense of belonging due to identity and skill level.

[24]Dennehy, T. C., & Dasgupta, N. (2017). Female peer mentors early in college increase women's positive academic experiences and retention in engineering. Proceedings of the National Academy of Sciences, 114(23), 5964–5969. https://doi.org/10.1073/pnas.1613117114

3 METHODOLOGY

The main goal of the project was to gather a diverse group of perspectives to determine improvement points for diversity, equity, and inclusion throughout the focus departments at WPI. To achieve this goal, the team created a survey for students in focus departments, carried out interviews with students and faculty.

Focus departments were defined as: Computer Science (CS), Interactive Media and Game Design (IMGD), Cyber Security (CyS), Robotics Engineering (RBE), Bioinformatics and Computational Biology (BCB), and Data Science (DS). These departments were selected as CS or adjacent based on definitions created by the CS Department in 2019. Marginalized groups were defined as members of the following communities: women, LGBTQ+ (including non-binary and transgender people), BIPOC, international, first-generation, and disabled.

3.1 DATA PROTECTION

Keeping data protected is important to student safety and mental wellbeing. It is even more warranted when working with marginalized groups. All student data gathered during the survey was completely anonymous unless students chose to disclose contact information for raffle entering or for participation in a follow-up interview. When this is the case, all collected student information will be completely separated from survey results to preserve data privacy. No in-person or online interviews had video recordings. An audio file was recorded and scrubbed of all identifiable information during transcription.

3.2 SURVEY

The team conducted a general survey for undergraduate students in focus departments to gain understanding of general opinions on coursework, interactions with professors, club participation, and other aspects of student life. The survey was the main method of data collection as it established group consensus on certain topics and noted areas of disagreement that could be further explored in interviews. The length of the survey was made to collect meaningful data without discouraging students to complete it. A longer survey was necessary due to the large range of topics, from culture to curriculum, that needed to be explored.

Instead of creating a different survey for each focus department, the team worked to create one survey that could capture the general feelings of students across all focus departments. This way, students who were involved in multiple focus departments would only take the survey once. The team also reasoned that the data could be parsed by focus department or other information to isolate certain demographics, removing the need for multiple surveys.

The target demographic of the survey was students who declared their major in the focus departments, meaning they had spent at least one semester at WPI, as first-year students must typically wait until the end of the first semester to declare a major. This also increased the likelihood that these students had taken at least one CS course and could therefore provide insight into how CS curricula influenced DEI culture in the department. Though there was a target demographic in mind, the perspectives of all students in focus departments was important to building a robust display of the experience students have with CS as a whole.

Qualtrics enabled the team to create a general survey. Qualtrics has been used by several student projects in the past, meaning students would be more familiar with how to fill out questions using the platform. It also made the survey easier to create through its logic system that

tailors the survey experience to the individual based on previous responses. Skip logic will skip over questions if they aren't relevant to the survey participant based on previous responses. For example, if a student selects RBE for their major, the survey will skip over questions only relating to CS majors. Display logic does the same with more advanced AND OR logic which resulted in additional opportunities to improve the survey experience for participants. Using Qualtrics resulted in a better customized survey for participants.

Survey questions were based on a previous IQP-related study WPI conducted in 2017 to capture information on low female representation in the CS Department. The current project had similar intentions with an increased scope, so the team decided to use many of the similar questions. Certain questions were also compared with the previous IQP to understand overall department changes. Some gender identity questions were expanded to include sexuality and ethnicity; this provided a better understanding of how these aspects of identity impacted student experience. Similarly, questions pertaining only to CS were expanded to include all focus departments in relevant areas. Repeat or irrelevant questions were omitted. Certain questions from the previous IQP were condensed or removed to focus on essential information.

The survey consisted of 65 total questions, with students logically being able to answer fewer, which were a mix of radio-style multiple choice, Likert 1-5 scale, checkbox, and open response. Survey questions were organized in the following categories:

1. *General Background Questions*: background questions to help with customizing the survey experience including major, high school experience, extracurricular project experience, types of technology used for coursework, etc.
2. *CS Background Questions*: high school CS courses taken, work experience, project experience

3. *Technology Background Questions*: what kind of devices students use, experiences with resolving technology issues, usage of WPI CS labs
4. *General CS Department Questions*: atmosphere of CS Department, assumptions about CS, personal comfort in CS Department
5. *Adjacent Major Questions*: CS coursework difficulty and relevance to major
6. *Discord Questions:* involvement with Discord community for major
7. *Focus Departments Club Interactions*: active membership in clubs
8. *CS Course Interactions*: how coursework affects interest in CS, collaboration and lab work opinions, coursework assistance
9. *CS Faculty Interactions*: professor availability, faculty advisor helpfulness, representation by professors and student staff, accommodations support
10. *Department Feedback Questions*: looking at previous IQP recommendations like common space installation and feedback locations
11. *Student Identity Questions*: basic identity questions (gender, sexuality, ethnicity, etc.)
12. *Final Questions*: asking students if they would like to be considered for an interview and giving an offer to be entered into a raffle for gift cards. All information collected in this section was discarded after the raffle was determined.

The survey was mainly distributed through department heads and program directors of focus departments: Craig Shue (CS and CyS), Elizabeth Ryder (BCB), Gillian Smith (IMGD), Elke Rundensteiner (DS), and Jing Xiao (RBE). Professors in focus departments and student leaders in related student organizations were also contacted to further distribute. To further encourage participant completion, students who wished to provide their contact information were entered into a raffle of five $15 gift cards. These methods were chosen because they were

identified as most helpful in terms of encouraging student participation from the previous IQP on the topic. Other methods like QR code poster distribution were not considered because they were tried and determined to be not helpful compared to the previously-listed methods. The team also used Discord to distribute the survey to the general WPI community and specific communities like Computer Science or Cyber Security, given the uptick in online forum usage due to the pandemic. Survey questions are found in Appendix A.

The survey was closed after the team received 84 responses, after the response rate dropped significantly and the winter break came near. The majority of majors were representative satisfactorily as well with all departments except for BCB being surveyed. While the team did expect more survey responses than what was obtained, it was determined that the number of students representing departments was enough to draw certain conclusions about student experiences and perspectives. Because certain questions had below five respondents, certain responses to group questions were discarded. Survey results are found in Appendix B

3.3 INTERVIEWS

Several interviews were conducted to expand on survey results. The team wanted to gain a diverse set of perspectives from WPI students and faculty in focus departments to understand as many experiences as possible.

The team interviewed professors in focus departments to build a perspective on culture and curriculum from the faculty side. The team also wanted to learn more about how these topics have changed in focus departments during the faculty's time at the institution.

Student leaders of on-campus organizations related to the focus departments were interviewed to assess culture, community, and social behavior across the student body. Student

leaders not only have their own perspectives as students but also have exposure to the experiences of students in their organizations.

At the end of the general survey, students were asked if they would like to talk more about their experiences in an interview setting. Professors and student organization leaders were reached out to directly through email. Snacks and drinks, covered by the focus departments, were offered to participants during interviews.

Interviews were styled as guided conversations based on advice from the previous IQP to meet time constraints. They were scheduled for 30 minutes each. As they were designed to be semi-structured, questions were designed to encourage conversation that would expand on general responses from the survey and were left open for this reason. Interviews were conducted in-person and online in private environments to protect the privacy of all individuals involved. Interview questions are shown in Appendix C and interview transcripts are located in the supplementary information for the project. One professor interview transcript was omitted, but all other transcripts for student and professor interviews are present.

4 DATA AND ANALYSIS

4.1 INTRODUCTION

The team conducted a survey and several interviews to gain a better understanding of current student experiences and perspectives, especially of those in one or more marginalized groups. We specifically looked at student relationships between peers, professors, and the general CS community. The results show students feel isolated, unsupported, and pressured due to the current practices of the CS Department. In addition, while support from professors was generally positive and constructive, many students found advising to be unhelpful, with some stating they did not know who their advisor was.

4.2 DEPARTMENT DEMOGRAPHICS

4.2.1 Historical Statistics for Computing Majors

To gain a better background on the department from a historical perspective, it is important to review demographics and statistics from the past several years. 2017 was chosen as a point to start at for the enrollment statistics shown below due to it being when the previous IQP covering similar statistics was released.

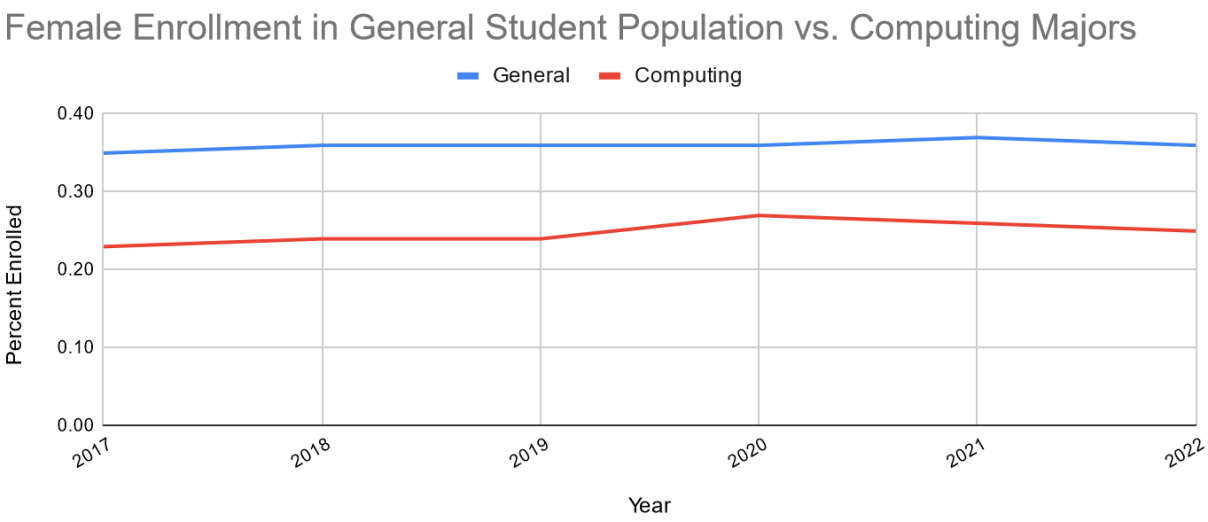

Figure 4.2.1.1: Comparing female enrollment between WPI and computing populations

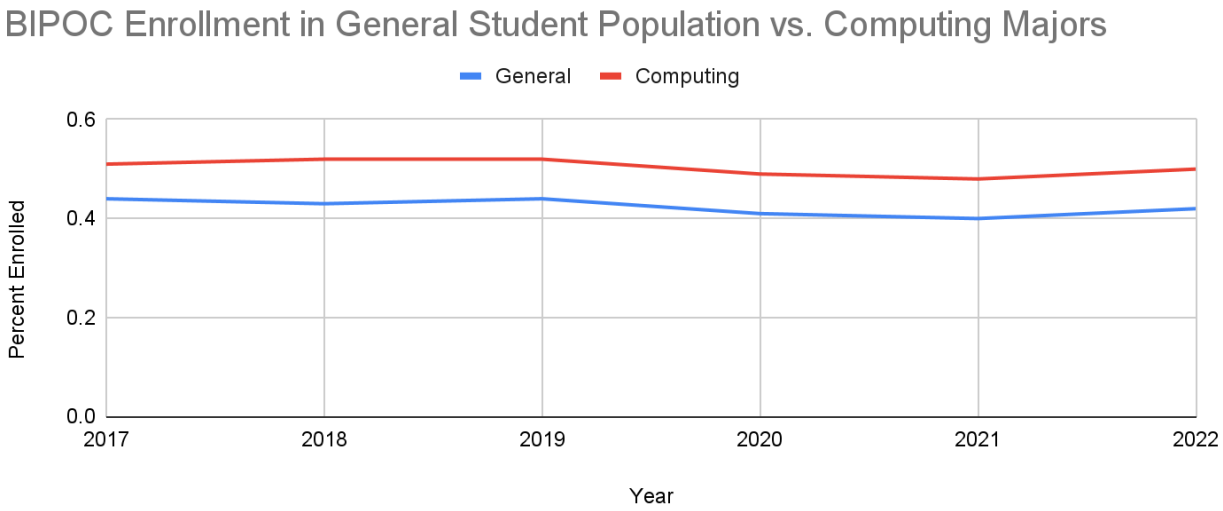

Figure 4.2.1.2: Comparing BIPOC enrollment between WPI and computing populations

4.2.2 Survey Demographics

For the survey, the important groups that we measured were the following:

- Major - the four majors that responded the most were CS, IMGD, RBE, DS. We also noted that a significant portion of the CS majors identified as under the Cyber Security concentration, so we will also be considering them as a separate major.

- Gender - Unlike the previous IQP, we were able to get a lot more non-binary respondents, so we will be able to consider them for this data as well. We allowed students to identify as multiple categories to better describe the demographics. For stats related to gender, we ignored students who did not prefer to disclose, and because there were too few cases, we did not consider those who preferred to self-describe. We also asked students whether or not they were transgender – we focused on differentiating queer gender groups
- Disability - We asked whether or not students identified with having general disabilities, physical disabilities, and invisible disabilities. Disabilities are any "physical or mental impairment[s] that substantially [limit] one or more major life activity,[25]" and classwork is no exception. Invisible disabilities were explained to study participants as disabilities that could not be seen externally.
- Race - Most of our respondents fell under either being white or Asian, and because there weren't sufficient students that identified as other races, we chose to analyze the data with the three groups of white, Asian, or neither to get the most out of this data.
- Clubs - Of the clubs that showed up, the clubs that had the most respondents were CSC, IGDA, RBE, UPE, WiCS and WiCyS. Other clubs that had fewer than 4 members respond were not considered for club statistics. We also compared students who did not identify as part of any major-related clubs as their own group to the rest of the clubs.
- We also asked about students who identified as international or first-generation students.

[25]ADA National Network. (January 2023). What is the definition of disability under the ADA? Administration for Community Living. Retrieved December 16, 2022 from https://adata.org/faq/what-definition-disability-under-ada

4.3 CULTURE AND COMMUNITY

One of the first questions that we were curious about was the perception of the CS community. A community should be built around being able to support its members, both from students and faculty, and it should be welcoming to newcomers while rewarding those who grow a fond connection with said community. It should be social, fun, and growing in order to be successful and appealing to outsiders and students in the major alike.

Atmosphere	**Percentage of Respondents Agreeing**
Friendly	47.6%
Community-oriented	12.2%
Individualistic	24.4%
Differences of opinion are respected	35.4%
Open-minded	30.5%
Fun	19.5%
Supportive	39.0%
Collaborative	36.6%
Welcoming	22.0%
Isolating	22.0%
Students are all treated the same	29.3%

Table 4.3.1: CS Department's community

When we looked at the data, we found that CS's community does not match that ideal. When asked to describe CS's atmosphere, only 12.2% of students responded that it was community-oriented, 22.0% students responded it was welcoming, and 29% of students agreed with students all being treated the same, regardless of identity. In our interviews, students often discussed a lack of general CS community and/or connection to the CS community. It seems that in comparison to the IQP in 2017, not much has changed in terms of a feeling of the general CS community.

4.3.1 Majors: CS, Cyber, Other Majors

The team broke down responses by majors and groups of majors to compare perspectives and experiences of students involved with different communities and coursework.

Atmosphere	**CS Majors**	**Non-CS Majors**
Friendly	44.0%	53.1%
Community-oriented	12.0%	12.5%
Individualistic	26.0%	21.9%
Differences of opinion are respected	36.0%	34.4%
Open-minded	30.0%	31.3%
Fun	15.6%	22.0%
Supportive	37.5%	40.0%
Collaborative	25.0%	44.0%
Welcoming	24.0%	18.8%
Isolating	20.0%	25.0%
Students all treated the same	24.0%	37.5%

Table 4.3.1.1: CS Department's community by general major

We found CS majors and non-CS majors disagreed on the atmosphere of the department in general. While both have similar amounts of people saying it is community-oriented, we noted that CS majors found the CS atmosphere to be less friendly compared to non-majors, and yet CS majors found the atmosphere more welcoming, ironically enough. CS majors also recognised the atmosphere as more individualistic compared to non-CS majors, far less supportive and collaborative. While CS recognises a semi-supportive environment across its major and its own classes, other majors will be much harsher in terms of their version of CS that they experience compared to their own major.

Atmosphere	**CS**	**Cyber**	**IMGD**	**RBE**	**DS**
Friendly	46.9%	54.5%	30.0%	45.5%	64.3%
Community-oriented	12.5%	9.1%	5.0%	9.1%	14.3%
Individualistic	12.5%	54.5%	20.0%	9.1%	35.7%
Differences of opinion are respected	37.5%	45.5%	20.0%	36.4%	35.7%
Open-minded	25.0%	36.4%	20.0%	54.5%	35.7%
Fun	25.0%	18.2%	10.0%	36.4%	7.1%
Supportive	37.5%	54.5%	20.0%	63.6%	42.9%
Collaborative	40.6%	45.5%	30.0%	27.3%	35.7%
Welcoming	28.1%	27.3%	20.0%	18.2%	21.4%
Isolating	25.0%	18.3%	30.0%	36.4%	21.4%
Students all treated the same	18.8%	36.4%	25.0%	36.4%	42.9%

Table 4.3.1.2: CS Department's community by computing major

Along with CS, there were three notable majors who responded to our survey: RBE, IMGD, and DS. We also asked CS students if they were part of the CyS program. To further investigate the case of CS's community, as well as understanding a bit more based on certain

majors' backgrounds with their home communities, we decided to compare these four as well. We found that their responses differed significantly from what we had from CS majors in their own different ways, and they depict a really interesting picture. Note that most of these numbers are all fairly low, but the differences are still worth noting, as they paint a picture of which groups are being isolated or treated differently.

CyS paints a more optimistic picture as a smaller group of students within CS. More CyS students believe that the CS atmosphere is friendly, collaborative, supportive, treating students the same, while a lot fewer students think of it as isolating. They also think it is less community-oriented and way more individualistic, however, which seems to indicate that their version of the CS atmosphere is more positive, but it is much less about the actual overall CS community and instead with the peers they surround themselves with. This also corresponds with how tight knit the CyS community is – of the CyS students who responded, an overwhelming majority of them reported to be in CSC or WiCyS. It's a really supportive atmosphere and helpful, but there's no sense of community outside of CyS. These students generally identified more with CyS than CS overall – of the 45.5% who found their major supportive, only 36.4% said the same about their CS courses. It seemed that some CyS students considered themselves distinct from CS as a whole. When interviewing a Cyber Security Club executive board member, they also reported that for them, CS felt a lot less cohesive as a community:

> *"I don't know if there's necessarily an atmosphere of people getting there, but I feel like a lot of people… are like, yeah, we should do this [activity], and then it doesn't quite happen."*

When we asked them how they compared it to the Cyber community, they expressed that there was a lot more connection with that over CS.

> *"Yeah, I'd say I feel more connected with the cyber community, ... we have CSC and WiCyS I can talk to all the time. I have talked a lot more with [cybersecurity professors] than most of the other professors in CS. "*

Another student mentioned the distinction between CS and Cyber in their response when discussing their place in the larger community:

> *"Most of [my friends] are CS majors, but these people are more cybersecurity-oriented, which is kind of on its own, I feel like it's separate from the CS major. People in cybersecurity, people in math, people in data science, who are all much more connected then I am to [the CS community]."*

IMGD generally had more negative responses when compared to CS majors when discussing the CS community, with only their perception of students being treated equally being more positive overall. Of the students who responded, they were the least confident about the CS atmosphere being community-oriented, and they also were the only major to report less support compared to the CS majors. IMGD has a creative and community-based culture, and this will become more apparent when we analyze the academic perspective for IMGD toward CS later on. While 63.2% of students in IMGD found their own major's peers supportive, only 36.8% of respondents were able to say the same about students in their CS courses. When we interviewed an IMGD student about how they felt in their place compared to the IMGD and CS communities, they said:

"If you're talking about IMGD and the art classes, I've met some people, I've talked to some people, I've had some friends, we've played Magic the Gathering, people have helped me in classes. In terms of Computer Science, I literally didn't talk to anyone in my class A-term."

A professor mentioned faculty culture in regards to DEI in the IMGD department:
"We have a group that is actively fighting against that bias, or talking and thinking about it differently, and actually continuing the work that the people left us, the work that they're doing. But they're more sure in what they're doing, so they speak more confidently."

When we then asked about CS, they said that CS still had more to go:
"I think that for me, that's something that the CS, with all the hires recently, since it wasn't paying attention to that, those are the conversations that it's not having, or not as much as IMGD is having."

RBE is an academically intensive, community-based major based on student feedback. While students in the department found the CS atmosphere more friendly and much more supportive than CS majors did, they found it less community-oriented and much less collaborative. RBE is a very collaboration-heavy major, especially with its introductory set of courses, and with that background, they have a unique perspective on how CS feels as a whole. This affects the more visible support they feel from CS courses as well – despite the CS

atmosphere seeming supportive, similar to IMGD, only 30.0% of RBE students reported their CS courses having students who were supportive and encouraged each other to succeed, much less than the 60.0% in their own major. IMGD and RBE were the two majors which responded better than CS to the statement “I feel like a part of my department”. When interviewing an RBE/CS double major, they had this to say:

> *“With respect to the students, I don't feel a strong connection to the CS Department as I do with RBE. RBE, I know people by name, and I interact with them in and out of class; CS, I get more the feeling that, I run into people who are CS majors, that happens a lot, I see some of the same people in some of my classes, but I don't really interact with them.”*

When we asked them more about the supportive nature of RBE, they said:

> *“It's not a competitive environment, it is helpful, at least a little bit collaborative. But in RBE, pair support is what makes the major work. The SAs are just the key to the major, they make it work… in RBE, [identity is] not a problem, we're all suffering together, including the professors, so there's no time to be a jerk.”*

DS is one of the newer majors, as it only became its own major in 2020. Its culture has therefore been emerging in these past few years. We can see this volatility in their responses to how they responded to the statement “I feel like a part of my department,” which only 30.8% agreed with, lower than CS itself. DS also shared similar numbers to CS with regards to students in their major being supportive, both hovering at around 50%. Perhaps most notably, DS finds that only 46.2% of students find that their identity does not hinder their success in courses, which is drastically different from the numbers being between 60% and 80% for the other computing

majors. There is still a lot to be done in terms of the DS culture by itself, however DS students interacting with the CS community was largely positive. It notably was the only major which had a majority of the respondents find the CS Department friendly, and more than 40% of the students said that they felt treated the same. We weren't able to get any significant interview data regarding DS, but we can say that there is a lot to be desired with DS, and that further exploration is required.

4.3.2 Gender

Atmosphere	**Male**	**Female**	**Non-binary**
Friendly	45.5%	47.2%	41.2%
Community-oriented	9.1%	11.1%	11.8%
Individualistic	27.3%	25.0%	41.2%
Differences of opinion are respected	42.4%	33.3%	23.5%
Open-minded	42.4%	25.0%	23.5%
Fun	21.2%	22.2%	0.0%
Supportive	45.5%	27.8%	35.3%
Collaborative	45.5%	25.0%	29.4%
Welcoming	24.2%	13.9%	23.5%
Isolating	27.3%	16.7%	29.4%
Students all treated the same	42.4%	27.8%	11.8%

Table 4.3.2.1: CS Department's community by gender

While all the gender groups share similar perspectives on friendliness but a lack of community, there are some interesting patterns in the other statistics. For example, students who identify as male are more likely to describe CS as supportive compared to other gender identities,

and this pattern continues for collaborativeness and students being treated the same. Compared to others, fewer female students find the atmosphere to be welcoming, while more find it isolating. Only 30.3% of female students felt like a part of their department, and only 54% of female students felt in control of their experience. The department's historical statistics have shown that the gender ratio has been largely in favor of men, both for faculty and students, and as our interviews have reflected, many people have commented on the male bias that the department still holds. A student in CSC had this to say regarding students who were assigned female at birth (AFAB):

> *"CS, it's interesting, every once in a while, you get the "Oh, I'm the only AFAB person in here," you get that every once in a while, it's not always super obvious, but ugh, you get that sometimes."*

This is also one of the reasons that clubs like Women in Cybersecurity and Women in Computer Science exist to provide a space that doesn't fall under male bias:

> *"I know a possibly large part of why WiCyS exists is because the CSC used to suck. I am the first non-male non-secretary exec member. [We would love to get] more people who are not white cishet male in, though I don't know how easy that'll be, considering the amount of people in the major who are not cishet males is a little low."*

However, despite these spaces existing, they don't always fulfill their role of providing a space for gender minority groups, because some people don't feel as in-line with them and don't want to "intrude" on the space of other marginalized groups. When talking about women-only spaces in relation to community, a student mentioned:

"I use she/her pronouns, but I don't always feel comfortable in women's spaces, so I don't want to join those women-only clubs, because it just doesn't feel right to me. I feel like in that regard, I haven't been able to really participate in whatever Computer Science community exists."

Throughout the interview, it seemed clear that they were very focused on the women's experience within CS, and ended saying this:

"CS has a major culture problem. It's a huge problem. All of these things add up. It becomes a very lonely, very very lonely place for women."

Non-binary students found the atmosphere to be more individualistic, and not a single non-binary student described the atmosphere as fun. When asked about "students being treated the same," non-binary students were less likely to agree with the statement than female students.

Atmosphere	**Transgender**	**Cisgender**
Friendly	50.0%	48.3%
Community-oriented	12.5%	11.7%
Individualistic	18.8%	25.0%
Differences of opinion are respected	18.8%	38.3%
Open-minded	12.5%	30.0%
Fun	6.3%	23.3%
Supportive	31.3%	41.7%
Collaborative	31.3%	38.3%
Welcoming	31.3%	18.3%

Isolating	31.3%	20.0%
Students all treated the same	18.8%	31.7%

Table 4.3.2.2: CS Department's community by transgender status

When looking at transgendered students vs cisgendered students, we found similar results. The notable results here are how fewer transgender students found the atmosphere fun, supportive, or collaborative. Transgender students also felt students were treated the same regardless of identity less than cisgender students did. These factors together seem to contribute to a greater sense of isolation.

Interestingly, trans students find the atmosphere a bit more welcoming and friendly, but based on the other numbers, there's a case to be made for whether or not this is surface-level. Trans students seem to be doing well, with 81.3% of trans respondents agreeing that their identity does not hinder their success in courses, but only 25% of them feel like a part of their department. From our interviews, there was a lot of agreement about how queer people in the department felt accepted for their gender identity:

> *"I've also made a lot of friends due to being trans and gay, and I feel a lot more confident about being myself[...] As of general, people have been really supportive of me being trans and use of my pronouns."*

4.3.3 Race

Atmosphere	White	Asian	Underrepresented Groups
Friendly	51.7%	33.3%	42.9%
Community-oriented	13.8%	11.1%	0.0%
Individualistic	22.4%	22.2%	42.9%
Differences of opinion are respected	36.2%	27.8%	42.9%
Open-minded	27.6%	38.9%	28.6%
Fun	22.4%	16.7%	0.0%
Supportive	41.4%	33.3%	28.6%
Collaborative	37.9%	38.9%	14.3%
Welcoming	24.1%	16.7%	14.3%
Isolating	22.4%	16.7%	28.6%
Students all treated the same	25.9%	33.3%	42.9%

Table 4.3.3.1: CS Department's community by race

When analyzing race, the team found it more difficult to weigh compared to major or gender due to the drastic difference in sample size between groups. There are a lot of missing groups from the population we surveyed that in the future, we would like the CS Department to further consider.

That being said, there are still some numbers that immediately stand out. Non-white students found the CS Department less friendly and welcoming as a whole, and all the students who were neither Asian nor White disagreed with CS's atmosphere being community-oriented or being fun, while greatly agreeing with the major feeling individualistic. Interestingly, when asked about students all being treated the same, we found that non-white students seemed to

agree more with this statement, though all these numbers are still under 50%, which is still an issue with the environment as a whole.

WPI has historically had a predominantly-white population, especially in comparison to other universities in New England, but CS's culture specifically has an issue with white men dominating both the faculty and student population. When asked about identity concerns, most students did not bring up their race as a factor, instead citing gender-related incidents that they've had. It seems that the question of identity tends to fall on the question of gender over race, which is a mixed bag – either gender-related issues have been so prevalent that they dominate the conversation, or we have been putting race to the side in terms of concerns that require addressing. Only one student who we interviewed didn't have any negative experiences related to identity at WPI, but they had this to say, something insightful into how CS's atmosphere currently stands:

> *"Nothing negative has happened on my behalf. I'm a straight white male, so honestly, things are in my favour, which honestly, that's just how it is, but I've not had any negative experiences like other people."*

The awareness behind the statement is incredibly important to consider, because acknowledging privilege has been an issue with individuals identifying outside of marginalized groups. On the other hand, a professor specifically talked about race alongside gender throughout their interview, citing reports that were disturbing as a whole:

> *"On the racial side, we are hearing reports, and I don't know if this is related to the department in particular, but for the student experience at WPI-wide, our students of*

color are reporting that if they travel at night on the WPI campus, sometimes they have run-ins with law enforcement, not thinking they belong."

They then cited the bias in the CS community as a whole; there is still a lot to be done in terms of actually improving how students view and interact with racially-marginalized groups:

"Our students, sometimes, have backgrounds where they are not realizing that they're being completely and utterly racially insensitive with remarks, not even realizing that they're doing it."

Overall, though we have limited results, there is a lot of work to be done in this subject, and it certainly is part of the conversation around DEI alongside other marginalized identities.

4.3.4 Disability

Atmosphere	**No Disability**	**Disability**
Friendly	48.2%	40.0%
Community-oriented	14.3%	0.0%
Individualistic	26.8%	25.0%
Differences of opinion are respected	35.7%	35.0%
Open-minded	32.1%	20.0%
Fun	21.4%	10.0%
Supportive	42.9%	25.0%
Collaborative	46.4%	15.0%
Welcoming	21.4%	15.0%
Isolating	21.4%	30.0%

Students all treated the same	33.9%	20.0%

Table 4.3.4.1: CS Department's community by disability status

Almost every single statistic ruled worse for students identifying as disabled; not a single disabled person sees CS as being community-oriented, and few disabled students believe that the CS environment is supportive or collaborative. One of the interviewees who identified as autistic had this to say regarding WPI as a whole:

> *"I have also found that certain people will treat me differently when I let them know I'm autistic, which is very weird to me because they talked to me before they knew I was autistic, and now I told them [I'm] autistic, and now [they think,] "Uh oh, that's a disabled person," and I'm still the same person you're having a conversation with this whole time."*

They then described the changes they would like to see with regards to this:

> *"When it comes to disability, a big problem is that nobody is ever taught how to talk to disabled people. I think that needs to change somehow. I don't know how--maybe make like a pamphlet to hand out to people, or some kind of presentation, but there needs to be a change around that, I think."*

In interviews, ableism and improper accommodations for disabled people were discussed not just as CS Department issues, but systemic issues with WPI. When interviewing a professor, they had this to say regarding disability at the school:

"Disability is a big problem. Some of this is not even stuff I've seen in my own classes, but I talk to people, and I think it's important to know that's happened elsewhere. Even if it's stuff at other schools, you learn it where you can learn it. I see a lot of students where people feel guilty for asking for help, people feel guilty for being disabled, they have a whole lot of internalized ableism."

The professor then elaborated on these details, citing the specific ways that WPI as a whole is behind on accessibility services and capability of accommodating disabled students:

"Some of it can be pretty egregious, if someone uses a hearing aid system and needs it, and just not having it in any of the classrooms, or someone needs a stenographer and they can't get it, someone needs a notetaker and they can't get it, very specifically, WPI has been explicitly cheapening our deaf accessibility, for subtitling, they've been going out of their way to make it worse."

When we asked them later on about what resources would be helpful to their job as a whole, they immediately went to accessibility first:

"One of the biggest things would be for the school to give a [expletive] about accessibility issues. When I first started here, there was a lot of issues with that. In meetings, I would talk about how I wanted the school to pay for accessible office furniture because the kind that was here when I moved in was not enough for my health needs, and I got this very dismissive response."

Not just the CS Department, but WPI as a whole had a long way to go regarding accessibility issues and disabled students. Without really resolving those issues, there's no way to properly assess how the CS Department can specifically improve, especially with CS which is a relatively-flexible study compared to more hands-on majors like Mechanical Engineering. This issue will come up again when talking about academics with disabled students, as these two go hand in hand. If a student is struggling to thrive in their academic role, it is much harder to find their space in the community as well.

4.3.5 International Students and First-Generation Students

We found that international students have a very optimistic perspective in terms of the CS atmosphere. The only statistics that reflected worse compared to domestic students were that international students found the atmosphere less friendly (37.5% vs 48.6%), as well as less fun (12.5% vs 20.3%). Other than that, there were not many deviations from the general student perspective gathered by survey data.

For clubs, we found that they tended to fall in line with their respective majors. For example, CSC and WiCyS both roughly matched CyS statistics, while IGDA was similarly as pessimistic as IMGD was. One notable exception in our club data was Upsilon Pi Epsilon (UPE), which had a very optimistic view on the atmosphere of CS. These numbers were very different from the general CS landscape, as they reported much more favorably with regards to the CS atmosphere being supportive, collaborative, and welcoming, each label having over 50% of the UPE respondents agree. One student brought up UPE during their interview, noting a certain distinction between the CS community and UPE:

> *"Either you make it into UPE, or you don't, and that determines whether or not you get to participate in the computer science community at all."*

Since the focus is mainly on improving the general CS Department as opposed to specifically the CS honor society, we acknowledge these numbers, but we will be focusing more on the consequences of our above listed sections.

When surveying first generation students, we also found that like international students, they had a very optimistic view of the CS atmosphere. They believe that the atmosphere treats students the same by a significant amount compared to non-first generation students (43.8% vs 25.8%), and they also found it significantly more welcoming (18.2% vs 37.5%). In terms of community-related issues, there seems to be not many correlated directly with first-generation students.

4.3.6 Fuller Commons

Over 45% of CS students reported never visiting Fuller Commons, and only 7% of students visited once a week, with nobody visiting most days. These numbers are worse for non-majors, with over 66% of IMGD and RBE students never visiting. Of the CS majors, students often cited their experiences with Fuller Commons were purely academic-based, with 63% of students saying they used the space for academic reasons while only 4% stated using it for social gatherings. Most students used the space for collaboration with classmates on group projects or as a place to host homework and study sessions. This is different from other communal spaces mentioned by students. For example, the Physics and Math lounges are used mainly for building connections between students and relaxing instead of doing work. As Fuller Commons is known as an academic space rather than a relaxation space, students tend to continue this idea.

The placement of Fuller Commons may also be contributing to its reputation as an academic space. Often, students will use the area as a place to wait for their next course in the Fuller building, as it is right next to the Upper Perrault Hall. As this room is used by multiple majors for lecture space, this means students waiting in the commons may not actually be CS students. As there is no door closing off the commons from the rest of the building, it often becomes extremely loud during passing periods, making it a hard place to spend time peacefully.

Students in computing majors outside of CS noted that their respective common spaces were for relaxing and hanging out with friends over academics. The CSC executive board member interviewed mentioned that:

> *"It seems like there's a lot of people just hanging out in the math lounge all the time and just chilling ... people go to the math lounge to hang out, and people go to the CS lounge to do work."*

4.3.7 Discord Communities

With over 400 people in the main WPI Discord server, the team wanted to investigate how the platform was used as a tool by individual computing communities to connect with each other. Over 75% of respondents reported that they were part of the Discord server for their communities with varying levels of participation. Most students reported being a member but not engaging with their Discord server frequently, but 40% of those in their communities either keeping up with posts regularly or being regular posters themselves.

There exists a CS Discord server, but only 29% of the CS majors responded that they kept up-to-date on posts in the server, and 23% of the CS majors were not even part of the server. As we'll come to see later, these numbers are way less comparable to other major-specific servers. A few of our interviewees talked about the CS server, and they provided the following:

“I don't check the CS discord as often, I find that it's not very active, and the people who use it tend to be much higher knowledge there, so I can't really help with anything.”

“I use Discord for specific classes as opposed to the general CS Discord, I don't use it as much. I know other people do use it, but I don't use it.”

“My hot secret is that I am a prolific Discord user, and the WPI CS server has been a cursed entity in my mind for a long time. It never sat right to me[...]I don't want to interact there as much because it just has such a weird vibe. Their stance on moderation is, I don't vibe with it.”

“I know there's the WPI CS Discord that I don't really enter, and it seems like people talk a decent amount in there, and for every class, they have a channel, I don't know, I don't really go in there, because I'm a bit of the "I know what I'm doing, I'm good" [archetype].”

In general, the responses were ranging from the server either being not really necessary, to not being helpful at all. All of the responses cite the server mainly being used for an academic purpose over a social purpose, and there’s a decent mentioning of the technical knowledge over the social aspect of the server.

When analyzing CS majors, we also took note of students who were in CSC – our interview with the CSC executive board member reflected that CyS students tend to use the Discord a lot, and it’s been very helpful, and combining that with the statistics of over half of the

members being inactive or not in the CS server, it makes a lot of sense that instead of choosing a CS server that has been described in the above as either not useful or problematic, they are able to thrive in a space for their club with people who they are familiar with and interact daily.

We found that the two Discord communities with the most active population were IMGD and RBE. IMGD and RBE are servers run by students with professor involvement. Both servers perform significantly better in terms of recruitment when compared to the CS Discord server. Under 10% of IMGD students reported to be not in the server, and all the RBE respondents reported to be in the server. In addition, both have significantly better active user bases, with 47% of IMGD students being up-to-date in their server, and a whopping 72% of RBE students being up-to-date. In an interview with an RBE student, we discussed a lot about the RBE Discord, and they said that they were much more active in that server compared to the CS server, citing the social and academic aspects of the RBE server:

> *"It's definitely a mix. There's dedicated class chats related to 1001, then the 2000s and 3000s, where you can ask questions about this class[...]But then there's other channels that are purely just social, like #unrelated-flim-flam, that's the equivalent of a random channel."*

When we asked about how the professors being a part of the server affected things, they responded positively, citing it to be a huge part of why it's so influential on the major:

> *"I feel like having the professors there has made it more successful, because now not only is it a social space, it's also a quasi-academic space, to get advice from the professors and to get help in class from the professors."*

Some CS professors started using Discord for their courses, and they've that success in developing a social and academic connections with students as part of this, as one professor said:

> *"Professors who use Discord, I think it's helpful that they've been reaching out to the community and me in that way, because we all use Discord now, so I like how they're taking that extra step to connect with students."*

In addition, we compared a few other groups in terms of their Discord usage. We found that disabled students are very active on Discord, with 50% of disabled students reporting to be up-to-date on posts for their respective major, compared to the 27.6% of able-bodied students. Discord is a useful tool for students, since it is an asynchronous tool for communicating with other students at any time, as long as others are active during that time, and it is also accessible from anywhere, meaning that students who have physical restrictions with moving around stand to benefit from it as opposed to being forced to go to a physical space. There's a clear value in cultivating a useful, active, and supportive Discord space for students, as seen by the usage rates of certain groups.

4.3.8 Major-Related Clubs

In some of our interviews, we noted how the emphasis of having a club for students encouraged a sense of community that was lacking in the general CS Department. One student mentioned how despite being similar departments, CS did not have a general non-professional club, even if UPE and ACM existed:

> *"The level of difference [between the math community and CS community] is so high, because the math community is so tight-knit, even looking at other majors as well, math*

has a Math Club, data science has a Data Science Club, but there's no Computer Science Club."

CyS has a club for its unique concentration within CS, and we point to when our CSC executive board member talked about the engagement in the club:

"I was real happy with the 20-30, especially at the start of the term, we can maybe even get to 40, that was fantastic. I also like when people are active in the Discord and talking to each other about whatever. When you see different faces talking in the Discord and not just the same two or three people, that's great."

We can see that how that affects the statistics surrounding CyS, as a vast majority of the CyS respondents are in CSC or WiCyS, and a large part of them report a supportive atmosphere, not from an existent CS community, but rather a tight knit group of CSC club members that are all familiar with each other. At the moment, there doesn't seem to be a true common space for CS students of all levels to gather in a non-professional setting.

4.4 CURRICULUM AND DEPARTMENT SUPPORT

In addition to the general social and community sphere of the CS Department, the team analyzed the academic sphere of the department. The two go hand-in-hand with each other, as having a support network and welcoming circle of peers will help students succeed academically, while academic success leads to security in the community and more opportunities.

Unfortunately, the CS Department seems to also have particular issues with this aspect as well. We asked about the atmosphere of the CS Department, and we also asked about perceptions

that people in CS generally hold. Both indicated that the CS climate seems to be a mix of being challenging for students, while also not fulfilling its role to prepare students adequately for post-undergraduate experiences. When asking for interview across faculty as well, it seemed indicative that there was a lot to be desired from the faculty-side in terms of trying to improve conversations surrounding DEI,

Atmosphere	**Percentage of Respondents Agreeing**
Encourages asking for help	56.1%
Too focused on academics	28.0%
Boring	13.4%
Intellectually stimulating	45.1%
Competitive	32.9%
Performance-driven	39.0%
Listens to student feedback	31.7%
Too hard/challenging	18.3%
Easy to reach	9.8%

Table 4.4.1: CS Department's curricular atmosphere

Here, the numbers that stand out the most are how more than 25% of respondents believe the atmosphere to be too focused on academics, competitive, and performance-driven. Only 31.7% of students believed that the CS Department listens to student feedback, and perhaps most alarmingly, only 9.8% of students considered the department easy to reach.

In response to Question 4.2, students also responded to general beliefs about CS that they believed most people to hold. 67.1% of students believed that “CS is too difficult for most people” was a common statement, 41.8% of students believed the same with “CS is too

time-consuming to learn," and 35.4% of students believed the same with "a person has to give up outside interests to study or work in CS." These statements all indicate that CS has a high barrier of entry as a field of study, and that there is an intimidation to trying to get into CS as a newcomer. We will be looking further into how these numbers break down individually across marginalized groups and other target populations.

4.4.1 Majors

Atmosphere	**CS Majors**	**Non-CS Majors**
Encourages asking for help	64.0%	43.8%
Too focused on academics	24.0%	34.4%
Boring	14.0%	12.5%
Intellectually stimulating	56.0%	28.1%
Competitive	32.0%	34.4%
Performance-driven	42.0%	34.4%
Listens to student feedback	36.0%	25.0%
Too hard/challenging	16.0%	21.9%
Easy to reach	8.0%	12.5%

Table 4.4.1.1: CS Department's curricular atmosphere by general major

When looking at CS majors specifically, some responses seemed natural. For example, CS students felt much more intellectually stimulated, which makes sense as it's the field of study they chose, as opposed to non-majors who take CS courses for the sake of course requirements. The majority of CS students find the atmosphere to be encouraging of asking for help as well. However, some numbers do not line up as nicely. More CS students actually found coursework boring compared to non-CS majors, and alarmingly, CS majors found the department less easy to

reach compared to non-CS majors, who already have a very low percentage of people agreeing with the statement.

Clearly, this is not a mere issue of non-majors being unfamiliar with faculty and therefore having barriers to outreach. Instead, this is a departmental issue where even its own students are unsure where or who to go to for assistance. This statistic is also noticeably lower than the already-low number of students who find the CS atmosphere community-oriented. In most of our interviews, students mentioned specific professors that they really appreciated, with these professors tending to show up time and time again throughout the interviews. However, with criticism toward the CS Department, students tended to feel that they were unable to express their opinions or issues effectively.

When we looked at the ways that students communicated to the department, we found that 55% of CS students did not use any communication channels, and 36% of them went to online forums like Reddit or Discord to discuss the problem. While online forums are important for discussing issues amongst peers, the department faculty is unlikely to gain valuable feedback, both because students want to be able to talk about these subjects freely without interference of faculty, but also because of how little the faculty is involved with students in terms of communications outside of their courses or advising work.

When further looking into the numbers surrounding each major, we find that there are distinct patterns across each major's academic experience, including how useful the skills developed in CS courses is for their curriculum, and the level of difficulty that goes into CS courses.

Atmosphere	**CS**	**Cyber**	**IMGD**	**RBE**	**DS**
Encourages asking for help	71.9%	45.5%	45.0%	72.7%	50.0%

Too focused on academics	21.9%	27.3%	55.0%	18.2%	21.4%
Boring	18.8%	0.0%	20.0%	0.0%	14.3%
Intellectually stimulating	46.9%	81.8%	35.0%	45.5%	21.4%
Competitive	21.9%	72.7%	25.0%	36.4%	28.6%
Performance-driven	34.4%	63.6%	30.0%	36.4%	42.9%
Listens to student feedback	43.8%	9.1%	25.0%	36.4%	35.7%
Too hard/challenging	6.3%	36.4%	30.0%	18.2%	7.1%
Easy to reach	12.5%	0.0%	5.0%	18.2%	14.3%

Table 4.4.1.2: CS Department's curricular atmosphere by major

CyS – When we look at CyS vs general CS, there seems to be a polarized version of the challenging CS experience that students are going through. Opinions such as performance-driven, competitive, too focused on academics are all stronger across the CyS sample compared to CS. However, numbers such as intellectually-stimulating and too hard/challenging are also up, and no students find it boring. Students finding the department not boring makes sense given that CyS is a specific concentration, students are already interested in a specific field of CS, and therefore they are more likely to tackle high-level courses that are related to their field. 90% of CyS students had agreed with the popularity of the sentiment, “CS is too difficult for most people,” and 70% believed that most people thought “a person has to give up outside interests to study or work in CS”. When speaking with our CSC executive board member, they agreed:

> *“If I can flash back to freshman/sophomore year, the intro classes, people were talking all the time and working with each other all the time. As it gets into higher level classes, I think you've got a lot more people who are like, 'I know what I'm doing, I'm all set.'"*

Across all the majors, CyS has the lowest number of people who think that the CS Department listens to student feedback, only standing at 9.1%. Even more concerningly, no CyS respondents found the CS atmosphere easy to reach. When we asked a CSC member about how student feedback generally fared, they had this to say, regarding student input and also course continuity, which we will touch upon later:

> *"I think just the professors who are currently teaching the classes should update the course descriptions, because some of them are wildly out of date… I feel like professors know what they're teaching decently well, [but they] don't really know what other classes are teaching, and that's where you need the student input."*

Out of these, we find that this last number is the most alarming. While the team may not have specific recommendations for the CyS concentration as a whole, not being able to reach the CS Department easily is a concern that must be addressed.

IMGD – The only other major that comparably finds CS just as challenging and difficult is IMGD. The IMGD major is built to accommodate a vast range of disciplines, all focusing on how they contribute to game development, ranging from "artists, programmers, storytellers, musicians, and explorers[26]." This is reflected in the kinds of courses offered, including storytelling, art, modeling, animation, audio, etc. It's a very creative major, and students are notably encouraged to create something that they're proud of. We can even see this in the way that they view future prospects, with there being a drastic dropoff with how many IMGD

[26]WPI Interactive Media & Game Development. (October 2022). Worcester Polytechnic Institute, https://www.wpi.edu/academics/departments/interactive-media-game-development

students agree with the popularity of the sentiment, “People only work in CS for money,” with only 28.6% of students agreeing, the next lowest number being CyS at 60%.

When comparing this philosophy to the way CS courses are organized, we can see an immediate problem. The CS Department's courses are great for teaching technical information, but they are not good at being adaptive or expressive. Two of our professor interviews really reflected how this needed to change. One professor expressed the difficulty with being able to create new course content:

> *“It's very easy to create a single assignment, and [set] up auto-grading for it, and then to never change the assignment... So that's no good. Being able to continue evolving projects to keep things current is a bit of a challenge.”*

CS benefits from creating infrastructure that is able to work with the same course content for years, but there are a lot of downsides to where because the content is designed to accommodate everyone, there is a lot less personalisation for students who are seeking a specific purpose from the course. Our other professor talked extensively about how expression in courses has been something challenging, and what they have been doing to change that. For an AI ethics course they taught, they encouraged students to actually bring issues that were relevant to them instead of boilerplate examples that everyone used. The most notable example that the professor brought up with regards to creativity was the following:

> *“In the grad course I'm planning for next term, there's a lot of people in kind of the creative computing space and programming languages for education space that do have more focus on inclusivity issues, and so one way to make the curriculum more inclusive is*

to actually talk about that work… In your first year, teaching you the program is kind of enough, but by the end, we want you to have powerful thinking."

As it stands, the team believes this is one of the primary reasons why IMGD suffers so heavily in the CS environment compared to other majors like RBE and DS, which offer a smaller variety of courses. IMGD students found CS content significantly less helpful for their major compared to other majors as well, hovering at around a mean of 3.3 out of 5. They also cited being less prepared for CS coursework than other majors as well, with a mean of 2.8 out of 5. IMGD is an outlier with how much they believe that there is too much focus on academics, at a whopping 55%, and they are also the only major to find CS as comparably difficult to CyS, at 30%. They also find it the most boring, at 20%. What this shows is that CS as a department needs to find an equally expressive outlet for IMGD students in their CS courses. This won't just benefit IMGD students, but it will also make the department more personal for CS majors and other majors as well.

RBE – RBE majors line up closely with CS majors. Ironically, they find it easier to reach the department than CS majors, but also find less success in having effective results from the feedback. While no RBE student finds CS boring, notably more RBE students find the department to have a competitive atmosphere. They had a notably low response rate to the popular statements, "CS is too difficult for most people," and "CS is too time-consuming to learn," having only 40% and 20% respectively. In fact, only 10% of students thought that "A person has to give up outside interests to study or work in CS" was a common sentiment. One possible explanation is how work-intensive RBE is in comparison, as one interview subject described the experience as being survivors together. They were able to provide us a comparison

between the academic experiences of the two, and it seemed that RBE's support was a lot more tight-knit and immediate compared to CS, where the department was able to actively guide you as opposed to CS where it is mostly every person on their own:

> *"RBE is definitely more supportive, at least between students. It's kind of the foundation of what keeps RBE majors going, it's the SAs, having extra office hours. Whereas CS, it's a little more on your own. You can find classmates to help you, you can find friends to help you, it's not that there's no resources, most people just kinda stick it out themselves."*

RBE majors also have a Software Engineering course requirement. They found that CS course content was mostly helpful, the sample coming to a mean of 4.1 out of 5, but when asked about how prepared they felt for Software Engineering, the mean was 1.7 out of 5, an incredibly concerning statistic. In fact, for all the non-CS majors who were taking Software Engineering, only 3% of the respondents responded better than "somewhat prepared." We will go into course-specific criticisms later, but this is a first glance into how large of a hurdle Software Engineering is, especially for RBE majors.

DS – For DS, there seems to be a lot of mixed messaging, and this may be due to the previously-discussed volatility of the program as a relatively-new major on-campus. There is a significant drop-off with seeing the atmosphere encouraging students to ask for help, and DS also finds the atmosphere to be the least intellectually-stimulating. Again, there's not a lot to assess due to how new DS is, and because of the lack of information we got with regards to DS's atmosphere overall. DS majors found CS content to be the most helpful for their major, hovering at a mean of 4.4 out of 5. They do find the major challenging, similar to IMGD, with 64.3% of DS students agreeing with "CS is too difficult for most people" being a popular sentiment, as

well as 50.0% of DS students agreeing with “CS is too time-consuming to learn.” Hopefully, making changes that integrate CS courses better into the DS discipline, similar to our observations with IMGD, will improve these numbers.

4.4.2 Gender

Atmosphere	**Male**	**Female**	**Non-binary**
Encourages asking for help	57.6%	58.3%	35.3%
Too focused on academics	27.3%	25.0%	35.3%
Boring	15.2%	13.9%	11.8%
Intellectually stimulating	45.5%	36.1%	52.9%
Competitive	36.4%	33.3%	47.1%
Performance-driven	48.5%	30.6%	47.1%
Listens to student feedback	33.3%	30.6%	17.6%
Too hard/challenging	33.3%	8.3%	11.8%
Easy to reach	3.0%	11.1%	11.8%

Table 4.4.2.1: CS Department's curricular atmosphere by gender

Non-binary students report significantly more negative perspectives than male students on several fronts: encouraging asking for help, listening to student feedback, too focused on academics, and nearly 50% find it to be competitive and performance-driven. However, non-binary students find it the most intellectually stimulating and least boring compared to men and women. There seems to be an emphasis on self-empowerment when it comes to non-binary students, which matches with previous descriptions of how individualistic non-binary students found the CS atmosphere to be. When asking about whether students controlled their own experience in their majors, 82.4% of non-binary students agreed, which is greater than the 75.8% for male students and 54.5% for female students. They also report similar numbers to male

students for not having their identity hinder their success in courses, 76.5% to male students' 78.8%.

We should also note how female students find the atmosphere to be the least intellectually stimulating. We mentioned how only 54.5% of female students felt in control of their own experience, but we also should note how unlike their male and non-binary counterparts, only 57.6% felt that their identity did not hinder their success in courses. Unexpectedly, over one third of male students found the atmosphere too hard/challenging, and only 3% found it easy to reach. We noted how for our survey, most majors responded with relatively equal gender ratios apart from IMGD, which had significantly more male students respond than female students, so we chose to take a look at CS students' gender breakdown specifically, seeking to eliminate the skew in data. As it turns out, the numbers for CS students are even more exaggerated.

Atmosphere	**Male CS**	**Female CS**	**Non-binary CS**
Too hard/challenging	36.8%	4.5%	8.3%
Easy to reach	0%	8.3%	9.1%

Table 4.4.2.2: CS Department's curricular atmosphere by gender and major

The team did not want to make confident statements about these correlations, however we know that for women and non-binary students, they tend to have either women's spaces or queer spaces, as well as faculty members who identify as either to serve as mentors and people they can confide in. There is definitely a kinship between these groups, and by comparison, we find that men don't have specific groups to bond with or in. Ultimately, however, with how low the numbers are across all students who find the CS Department easy to reach, we think that this is a universal issue that is independent of gender, with specific groups being the gateway for female and non-binary students as a communication point with the department. As for too

hard/challenging, we are not sure if there are possible elements of toxic masculinity at play here, and this would require additional research beyond the scope of the project.

Atmosphere	**Transgender**	**Cisgender**
Encourages asking for help	31.3%	63.3%
Too focused on academics	31.3%	26.7%
Boring	12.5%	13.3%
Intellectually stimulating	43.8%	45.0%
Competitive	31.3%	33.3%
Performance-driven	37.5%	40.0%
Listens to student feedback	18.8%	35.0%
Too hard/challenging	12.5%	18.3%
Easy to reach	6.3%	8.3%

Table 4.4.2.3: CS Department's curricular atmosphere by transgender status

By comparison, there are fewer drastic differences between transgender and cisgender students. Notably, transgender students agree much less with the atmosphere encouraging asking for help, as well as listening to student feedback. These two seem to be more specifically disconnected from a student-faculty perspective. Overall, there are a lot of intriguing results here that require further examination at a later date.

4.4.3 Race

Atmosphere	**White**	**Asian**	**Underrepresented Groups**
Encourages asking for help	55.2%	61.1%	57.1%
Too focused on academics	27.6%	22.2%	42.9%
Boring	10.3%	22.2%	14.3%
Intellectually stimulating	48.3%	38.9%	28.6%

Competitive	36.2%	33.3%	14.3%
Performance-driven	37.9%	38.9%	42.9%
Listens to student feedback	32.8%	33.3%	14.3%
Too hard/challenging	15.5%	33.3%	14.3%
Easy to reach	8.6%	11.1%	14.3%

Table 4.4.3.1: CS Department's curricular atmosphere by race

When looking at statistics for race, we immediately see trends that follow with students who do not identify as white or Asian, the two largest racial groups at WPI. We found that these students find the environment much less competitive, as well as less receptive to student feedback. These groups also found it the least intellectually stimulating. Since these racial groups are being underrepresented at WPI, and the curriculum is biased toward white and Asian students, they likely don't feel as fulfilled by the content provided. We especially see this in the way that white students find the content the most intellectually stimulating, followed by Asians and then students not in either. While Asians are the most to find the atmosphere encouraging asking for help, they also find it the most challenging by far compared to other groups.

This racial bias in the curriculum clearly shows. There are examples where the curriculum really shows in its white bias, as one of our professors explained in an interview:

> *"There's a whole week of material [in my book] about searching for blue eyes in the family tree... I rewrote that… I made it searching for [a different trait in a] family tree instead of looking through your Aryan ancestors."*

There's also a lot of racial bias that seems to exist in the CS Department and WPI as a whole. Another professor went into detail about how WPI handles their diversity, making an

analogy to the recent Kanye West controversies over the past few years in which Adidas pulled out of a brand deal after enough public outrage was met, despite him having already said lesser but still significantly problematic statements. They believe that WPI has fallen into this similar hole:

> *"A lot of that, I think is also at WPI as well, where it's a tough conversation for a school that has been predominantly white males, like up to even eight years ago. "*

One professor also stated their opinion on the hiring process for CS as of late:

> *"I'll also say that the former head of CS [in my perspective] looked for the whitest people to hire. I'll throw that out there. That to me was the biggest red flag, which was, WPI lost out on many published articles and chances to get some really great scholars who are looking at [racism in] AI… WPI has not been part of that conversation at all."*

When it comes to discussing DEI, we noted that in most interviews, the discussion was often around gender and representing aspects that were designed to include women and the LGBTQ+ community, however, the school must keep in mind that race plays just as important, if not more of a part, given how much more one-sided WPI's racial statistics are:

> *"Our students, sometimes, have backgrounds where they are not realizing that they're being completely and utterly racially insensitive with remarks, not even realizing that they're doing it."*

> *"I think one of the things that I see now is for many people, DEI means LGBTQ+, and that is starting to become a major point in contention. Not on campus, but in the greater*

conversation with DEI, and it's really tough to navigate, because it always starts to seem like pitting one group against the other, when it's really like, no, we're trying to point out hypocrisy."

4.4.4 Disability

Atmosphere	**Disability**	**No Disability**
Encourages asking for help	60.0%	55.4%
Too focused on academics	45.0%	21.4%
Boring	10.0%	14.3%
Intellectually stimulating	30.0%	50.0%
Competitive	40.0%	33.9%
Performance-driven	40.0%	41.1%
Listens to student feedback	15.0%	35.7%
Too hard/challenging	10.0%	21.4%
Easy to reach	15.0%	5.4%

Table 4.4.4.1: CS Department's curricular atmosphere by disability status

Disabled students found the department focused too much on academics at a higher rate than able-bodied students while also finding it less intellectually stimulating. It seems that while disabled students find CS coursework less challenging, there is still a lot of pressure to perform despite the content not being as fulfilling. This pressure to perform can also be seen in the slightly more competitive view disabled students have of the CS Department when compared to able-bodied students. Though students with disabilities found it easier to reach the department than able-bodied students, they also had a more negative experience with their feedback being

listened to. This is frustrating for students, especially for students with disabilities that may not have the capacity to repeatedly contact the department to follow-up about changes.

4.4.5 Club-Based Groups and International Students

While most student organizations stay in line with the general surveyed population, certain clubs showed a deviation from the norm regarding thoughts on curriculum and course-related department atmosphere. UPE was a notable outlier, with no members in the organization that responded to the survey indicating that the CS was competitive or challenging, much different from previously-discussed statistics. Additionally, UPE members found it much more encouraging of students to reach out for help. As UPE is an honor society heavily involved with academic support for its members, this may have contributed to more opportunities for students to reach out for help with assignments and other coursework. However, the organization's members indicated that it was difficult to reach the department, with no members saying that it was easy to do so.

Another organization deviating from the usual statistics was WiCS. No members of the club stated that CS was too focused on academics, but nearly 80% of its members found the department competitive. As WiCS also has significant academic assistance opportunities for its members through study hours and other resources, this may balance out the CS workload. The emphasis on competition may be due to imposter syndrome, something discussed in club meetings occasionally. Imposter syndrome can create a divide between a student and their peers, leading to an increased sense of competing with other students to "earn their place in CS."

International students also had differences in perspective for a couple aspects of the CS curriculum. Only 25% of international students found it to be intellectually stimulating, versus 47.3% for domestic students. They also found it to be less competitive than domestic students

(12.5% versus 35.1% for domestic). Half of international students considered CS to be performance-driven, with only 37.8% of domestic students considering the same to be true.

For first-gen students, the statistics don't seem to indicate much. Other than a slight increase in too focused on academics (27.3% vs 31.3%), other statistics seem to really perform quite well, notably only 12.5% of first-gen students find the atmosphere individualistic (compared to 27.3%), and 50.0% of first-gen students find the atmosphere intellectually stimulating (compared to 43.9%). However, it should be noted that first-gen students feel worse about listening to student feedback, only 25.0% believing so (compared to 33.3%). There are not any clear patterns here which paint an immediate concern that needs to be addressed for first-gen students.

4.4.6 Course Content and Infrastructure

Creating inclusive, engaging, and welcoming courses through content and infrastructure helps students to get excited about topics while feeling confident enough to pursue more advanced material in the subject area. However, a lack of consistency with course prerequisites and descriptions, difficulties with introductory course material, and a general dissatisfaction with the lab component of many early CS courses has decreased the enthusiasm for some course content. Many students will recommend certain professors for others for courses due to vastly different experiences and material covered despite having the same course number. Improvised course infrastructure is also a problem. Often, the department uses technology as a needed aid to ensure courses run successfully due to a lack of teaching staff and other reasons. This results in a subpar experience for both the teaching staff and students, creating unnecessary stress for both sides.

We surveyed students about courses that had a reputation of being positive or negative. We went with this wording, since this course perception affects new students the most as they choose which courses to take with which instructors. For recording data, we went with columns for each course, as well as columns for unsure, N/A, or naming a professor in their response.

Out of the responses received, 20% of negative cases named a professor, while 17.5% of positive cases named a professor. This is important to consider, since some courses are exclusively taught by big professors, while other courses have rolling rosters of who teaches them. As in many of our interviews have displayed, there is a clear bias toward some professors in the department, both positive and negative, and it seems that in many cases, the positive professors make the experience memorable while being able to really connect and accommodate the student in question, while negative professors tend to offer very little resources for helping understand the course.

Of all the negative responses, we found that the top 3 responses were Software Engineering, Systems, and Racket. Software Engineering is notably required for Robotics Engineering, but it seems that in the responses, it's often cited that the biggest issue is the workload. Software Engineering is a curious case, however, because while it was the most negative course, it was also the second most positive course mentioned. There is also a distinction made in the responses that refers to which professor is teaching Software Engineering, and there seems to be a clear split between which version of the course is considered positive versus negative. One course having two vastly different experiences due to different professors seems to be a big problem, and this leads into one of the big issues with CS – inconsistency between courses.

It seems that there is a lack of understanding when transitioning from course to course about what content has been learned in prerequisite courses. While prerequisites are common in every other major at WPI, this problem is much more obvious in CS, seeing as the range of experience when students enter the major is very large. Many students can sometimes either come from having taken AP Computer Science A in high school, having taken online courses, or having worked on personal programming projects. This creates an environment where any given student can be very skilled in a certain discipline of CS (programming language, hardware, software, operating system), but still considered intro-level overall. This inconsistency leads to a few issues:

1. *Students are often advised to skip classes, either because they are already knowledgeable in it, because it is redundant, or because it is better to learn it themselves.* We've seen examples of students talking about skipping courses in Discord, as well as questioning how much the course prepares them for the given subject.

   Systems is a big example of this, seeing as while the course is meant to teach you C, that experience is mostly relearned in Operating Systems or through self-teaching, and many students find that Systems taught absolutely nothing. This is also the case for CS 1101/1102, which is a course that while it teaches you Racket with the intent on focusing on general CS principles, it only serves to alienate the student when they go into programming in mostly object-oriented courses.
2. *Students feel much less confident about their own CS abilities.* When we compared the data of how students were performing academically versus how students saw their own skills in CS, we found that most students' grades were better than what they personally

believed. This means that either courses are too easy and not equipping them well enough for graduation, or more likely, students do not feel confident about their own abilities.

3. *Students don't have a real chance at exploring interesting topics until late in their university experience.* There are generally two camps of CS students – students that do not know what they want to explore, or students that know exactly what to explore. In both cases, students are generally taking mandatory courses all throughout freshman and sophomore year, busy fulfilling CS requirements – it's not until late junior year or senior year that students actually being exploring courses that are interesting. We found that for courses considered to be positively received, half of the courses that were mentioned by students were 4000-level courses. Meanwhile, we saw at most 3000-level courses being mentioned in negative experiences, and even then, it is much less comparable to the courses that every student has to take. Considering that the question is about positive reputation, the fact that so many high-level courses are mentioned, and yet students are only allowed to explore them late into the university experience feels like an issue. For students who are still searching for their spark in CS, these are the exact kinds of courses that would help them pinpoint down a concentration, while for students who already know what they want, they have to endure all the not as interesting CS topics to get to the interesting courses, which can lead to burnout and course fatigue. Meanwhile, compare this to the math department, which mainly consists of finishing the Calculus series in the first year, and then spending the rest of the first year dipping toes into more advanced courses, being able to explore 3000-level courses freely by sophomore year already. There is an incentive for a placement test idea, which we will get to later in Section 5.

4.5 COLLABORATION

4.5.1 Majors

Computing majors have different levels of collaboration in their individual cultures. For example, RBE has a natural culture of collaboration due to the team based, project based curriculum. However, this doesn't always translate to collaboration experiences for CS coursework and assignments, so it's important to study each major without only acknowledging the home major experience.

Collaboration	**Non-CS Majors**	**CS Majors**
Increased Understanding?	56.7%	50.0%
Coursework Easier?	73.3%	58.0%
Hindered Work?	33.3%	64.0%
Felt Pressured?	20.0%	30.0%
Felt Respected?	26.7%	46.0%
Felt Supported?	30.0%	38.0%
Made Friends?	33.3%	58.0%
Prefer Collaboration?	36.7%	32.0%

Table 4.5.1.1: CS course collaboration by major

When we look at CS majors compared to other majors, we can observe some significant differences. CS majors notably find that collaboration does not help with making coursework easier, and it in fact hinders a lot of their work. Collaboration isn’t completely negative -- CS majors feel much more respected by their partners than non-majors and slightly more supported, and significantly more students have made friends from the experience compared to non-majors. However, more than 50% of CS majors find that it hinders their work, and less CS majors find

that it increases their course understanding, and less CS majors prefer collaboration over solo work.

Collaboration	CS	Cyber	DS	IMGD	RBE
Increased Understanding?	46.9%	54.5%	57.1%	50.0%	40.0%
Coursework Easier?	59.4%	45.5%	71.4%	72.2%	60.0%
Hindered Work?	62.5%	81.8%	35.7%	50.0%	60.0%
Felt Pressured?	34.4%	27.3%	14.3%	44.4%	10.0%
Felt Respected?	50.0%	36.4%	28.6%	33.3%	40.0%
Felt Supported?	34.4%	36.4%	35.7%	44.4%	30.0%
Made Friends?	59.4%	54.5%	42.9%	61.1%	40.0%
Prefer Collaboration?	25.0%	36.4%	28.6%	44.4%	30.0%

Table 4.5.1.2: CS course collaboration by major

Collaboration can be a learning experience for all group members involved in a project or assignment. However, the level of increased understanding from collaboration is low across all above majors. RBE agreeing with this sentiment the least may show the difference between CS and RBE courses, as RBE courses are designed around collaboration instead of most courses in CS that have collaboration as an optional element. This may be related to the low percentage of respondents in RBE that felt supported by partners and the higher percentage of RBE students who had at least one experience with a partner who hindered their work. When students don't feel that their partners are helping them to reach their full potential through assignment work, gaining an increased understanding of the material is much more difficult, especially if the student feels they have to do more than half of the work due to a lack of support from their partner. Students struggling with coursework could also feel limited by a partner not supporting them and therefore gain less from the work than they could with a more supportive partner. This

connection seems to hold for the other listed majors, though not nearly as drastically as for RBE. Students feeling respected by their project partners is important to success in coursework, so it's discouraging to see most majors struggle with a lack of this.

4.5.2 Gender

As the gender ratio at WPI in general is heavily weighted in favor of cisgender males, it is critically important to see how people with gender identities outside of the majority group are affected by biases during collaborative work with peers.

Collaboration	**Male**	**Female**	**Non-Binary**
Increased Understanding?	51.5%	48.6%	50.0%
Coursework Easier?	66.7%	62.9%	50.0%
Hindered Work?	57.6%	45.7%	68.8%
Felt Pressured?	27.3%	31.4%	25.0%
Felt Respected?	48.5%	28.6%	50.0%
Felt Supported?	45.5%	31.4%	25.0%
Made Friends?	54.5%	40.0%	62.5%
Prefer Collaboration?	42.4%	28.6%	12.5%

Table 4.5.2.1: CS course collaboration by gender

Men overall seemed to benefit the most from collaboration, though numbers across the board indicate a general dissatisfaction with group work. They had a strikingly large percentage for preferring collaboration when compared to the gender minority groups, even if it was less than half. This may be a result of men finding that project partners make coursework easier and a larger amount of support from team members. From previous looks at collaboration, a higher level of support often corresponds to a better view of collaboration, and this is the case here.

Women felt less supported and respected by their partners than men did, which corresponded to a lower satisfaction level with collaborative work over individual work. This seems to have contributed to feelings of imposter syndrome, as 31.4% of women felt pressured by a partner they perceived as doing too much work, which is much higher than the other gender groups analyzed. Women were also the least likely to make friends from project experiences, which contributes to feelings of isolation and an even more amplified feeling of imposter syndrome.

Non-binary students had mixed views on collaboration, with the lowest percentage of non-binary students preferring collaboration over individual work but the highest percentage of students making friends and being respected by project partners. This may be due to the sense of community among non-binary students and marginalized groups of students in general. Bonding over being in the minority gender-wise may lead to more connections between students and therefore more camaraderie. While non-binary students did seem to make more friends than the other genders, they also felt the least supported by their peers. However, respondents had similar percentages to men when it came to being respected by their project partners. This shows that support and respect from peers are distinct entities and need to be addressed separately to ensure the best project experience for all parties involved.

The team wanted to specifically look at the collaboration experience of transgender students. Many responses mirror those of other gender minorities, but there are some that stand out as important to discuss.

Collaboration	**Cisgender**	**Transgender**
Increased Understanding?	50.8%	71.4%
Coursework Easier?	68.9%	64.3%
Hindered Work?	50.8%	50.0%

Felt Pressured?	26.2%	21.4%
Felt Respected?	41.0%	21.4%
Felt Supported?	37.7%	21.4%
Made Friends?	44.3%	71.4%
Prefer Collaboration?	34.4%	28.6%

Table 4.5.2.2: CS course collaboration by transgender status

The most significant statistic we noticed was that transgender students were much more likely to make friends from collaborative work than cisgender students. We believe this is similar reasoning to non-binary students in that marginalized gender groups tend to create communities based on being outside of the minority. Many non-binary students identify as transgender as well, so this may also have an effect on the results. Transgender students also had an increased understanding of course material from collaboration when compared to cisgender respondents, however we were not able to make any firm correlations between other statistics, as it seems while understanding is improved, the coursework is not made easier in itself by collaboration.

4.5.3 Disability Status

Collaboration	**Disability**	**No Disability**
Increased Understanding?	36.8%	60.0%
Coursework Easier?	52.6%	70.9%
Hindered Work?	47.4%	50.9%
Felt Pressured?	21.1%	29.1%
Felt Respected?	26.3%	43.6%
Felt Supported?	10.5%	45.5%
Made Friends?	47.4%	52.7%

Prefer Collaboration?	21.1%	38.2%

Table 4.5.3.1: CS course collaboration by disability status

Students with disabilities seemed to fare consistently worse than able-bodied students when it came to collaboration. Disabled students received significantly less support and respect than their able-bodied peers without the benefit of increased understanding of coursework or making the coursework easier. With these statistics, it makes sense as to why disabled students seemed to prefer individual work over collaboration. This comes back to the pressure to perform that was discussed earlier with disabled students, as they must work harder to seemingly earn their partners' trust and respect, creating extra stress and diminishing some of the good effects of collaborative work.

4.6 OTHER FEEDBACK

Some feedback from students didn't fit into one of the above categories, but was still deemed important enough to discuss as part of the student experience.

4.6.1 Computer Lab Use

	Major			
Lab Use	CS	DS	IMGD	RBE
Not at All	58.8%	35.7%	52.4%	54.5%
Rarely	31.4%	50.0%	23.8%	27.3%
Occasionally	7.8%	14.3%	4.8%	18.2%
Frequently	2.0%	-	14.3%	-
All the Time	-	-	4.8%	-

Table 4.7.1.1: Frequency of computer lab usage by major

Students in computing majors have access to lab computers in several buildings on-campus to do work. Fuller Labs has several computer labs, including the Zoo Lab and IMGD labs. As shown in Figure 4.7.1, IMGD majors reported the most frequent usage of lab computers, with most respondents who used labs within the major using them for IMGD projects and the Adobe Suite. As most projects require design work using the Adobe Suite, this makes sense. Students also reported using the lab computers for accessing the secure network in the Zoo Lab and CAD work. As labs are a collaborative space for students to work together on projects and gain valuable feedback on assignments, the lack of computer lab usage is concerning.

4.6.2 Coursework Lab Sections

Outside of collaboration space, labs are used as a place to hold lab sections for CS courses. Labs are offered for many introductory-level courses including CS 1101, CS 1102, and CS 2011 as a way to practice and learn course materials while working with other students and teaching staff. Labs are often one to two hours in length and occur on Wednesdays. Often, assignments like homework and projects are started by students during these lab periods and attendance is counted to ensure students participate. Despite this, respondent satisfaction with labs seemed to be mixed. Only 6% of survey participants reported collaborating with other students during lab time, and 16% of people said they felt labs were a waste of time and even fewer (11%) found lab material interesting. With these frustrations, labs didn't seem to help the students with the coursework, as only 16% of students stated that labs increased course understanding. Interestingly enough, when asked if students would prefer lecture time to lab time, most said no. While the survey respondents don't represent the entire population of students attending introductory course labs, having a negative first experience with CS courses may contribute to an overall negative experience with computing as a field.

4.6.3 Device Support

Students frequently have technical difficulties with personal devices that may make it more difficult to complete work. Broken devices, devices incompatible with essential classroom software, and other problems are common in computing courses. Almost 17% of students experienced technical difficulties that inhibited their ability to successfully complete classwork in the last semester, Fall 2022. Of these cases, only around 11% of students used WPI's IT Department or the WPI CS Department as ways to assist with getting a temporary device or a fix to their personal device. While some students relied on friends and family to help, over 50% of students reported that they sought no help in getting a temporary device to complete classwork. Technical assistance, especially in the case of getting a temporary device with the CS Department, is not well-advertised; there are a limited number of laptops that can be 'rented' to students. Students that don't know about resources available aren't able to use them, and with the additional stress of already having a broken device, it may be hard for some students to seek out these resources.

4.6.4 Advising

Course advising is an important aspect of making sure students complete degree requirements and explore opportunities within their major. It is also a great way to build student-faculty connections in a non-lecture environment. With so many options to explore within computing, from CyS to Artificial Intelligence to theory of computation and beyond, having a robust system ensures students are aware of courses to take to fulfill their personal interests within the field. Unfortunately, WPI students responding to the survey and participating

in interviews routinely largely felt dissatisfaction towards the advising system in the CS Department as it currently stands.

Only around 35% of survey respondents found their faculty advisors very helpful or extremely helpful, with the rest finding mediocre help or no help at all. These statistics are amplified by our student interviews, in which a few students stated they didn't know their advisor or didn't feel their advisor helped them significantly:

> "*At one point, I emailed my faculty advisor, and then never heard back because they were busy."*

Some students had been shifted around to multiple advisors as professors left or were given additional responsibilities that diminished their ability to advise successfully. Overall, the advising program as it stands is a mixed bag with a combination of good and bad advisors:

> *"I've been shuffled around, like major advisors, 3 or 4 times now. I started with a person that was kinda like… "I want to do BS/MS"... and they were like, "Here, watch this hour and a half long video, I don't know anything about this."... My second advisor, [notable CS professor], was very helpful, very great. I…. Now I have [this CS professor] who I've never interacted with at all… so I don't really know."*

4.6.5 Teaching Staff Representation

Computing is a field traditionally dominated by white men, so WPI's representation of marginalized groups in teaching staff and faculty suffers. 30% of students identifying as female or non-binary felt there was only "a little" representation of their gender within computing, while males overwhelmingly said they had a moderate to a great deal of representation when looking at faculty. Similarly, transgender students felt extremely underrepresented by faculty in computing.

60% of transgender respondents noted feeling little to no representation. Around 75% of students in marginalized racial groups stated feeling a little to moderate amount of representation, while 57% of students in the majority racial group felt they had a great deal of representation within the computing faculty. This is a huge problem when it comes to mentorship and advising, because as shown before with women with female advisors, having a faculty member present to help students through shared experiences is important to student comfort, confidence, and success. However, a faculty member mentioned the desire of computing departments to increase diversity and student representation in the faculty body:

> *"... whenever there is faculty hiring, [the computing department] really take[s] into account diversity issues- they want the faculty body to be representative for the students that are taking our classes that are coming to WPI."*

The percentages for teaching staff, meaning student assistants (SAs), peer learning assistants (PLAs), peer learning mentors (PLMs), and teaching assistants (TAs), were similar in some aspects, but seemed to skew more towards a diverse group of students. Respondents in marginalized racial groups reported feeling higher levels of representation in the student teaching staff body, with 71% feeling a moderate amount of representation and almost 10% feeling a lot of representation. Students in the majority racial group had less decisiveness on having a great deal of representation, but still none stated that there was little to no representation in the teaching staff body.

While these increases in representation for teaching staff is good, there is still work to be done to ensure marginalized groups feel like computing teaching staff represent them a lot or a great deal. However, with gender representation, 80% of respondents identifying outside of male

as a gender identity noted little to moderate representation among teaching staff. Transgender students responded with slightly improved statistics to the faculty representation, with only 50% stating they felt little to no representation by teaching staff compared to the 60% for faculty. This may be reflective of the primarily cisgender and male student body in computing.

5 RECOMMENDATIONS

The team aimed to improve student experience, especially in regards to marginalized groups, in computing majors through a series of recommendations based on previous research and current student and faculty member perspectives. By improving student experience, we hope to also improve faculty member experience through more awareness of the importance of DEI practices.

To organize recommendations, we divided them up by which audience (students, faculty, the departments, and WPI) would be most effective at implementing the changes. While the audience may need assistance from other groups, they would be the leads for the recommendations. To ensure each group can effectively assess their implementation ability internally, the team will discuss timelines for the changes to be completed, potential collaborations with other groups, and measurements for success, all as applicable.

5.1 FURTHER RESEARCH

Before discussing recommendations, we wanted to address some data points that should be gathered to more successfully implement solutions. Though the team was able to gather a significant amount of data and create a few conclusions, there are some notable groups that are missing from the data, and we would like to the CS Department to find more regarding the following groups:

- Majors – This study got no student respondents from BCB, and we need those resources as well. BCB is centered around using computing and statistical methods to analyze biological data, and while we were able to gain some perspective as to the differences between some majors (such as IMGD, RBE, Cyber) and CS, we do not have anything for

BCB. We also were not able to get a ton of perspectives on Data Science in terms of interviews.

- Race – representation for students that were not white or Asian was limited, and we need more perspectives in order to be fully confident about the problems surrounding how they feel in the CS sphere.
- Clubs – the only club we were able to get an interview with was CSC, and having other perspectives would be really valuable. Interviewing the math and data science clubs would also be valuable, since they were mentioned as having really strong club identities that match with the major department, and those would be something great to learn from for CS.

5.2 RECOMMENDATIONS FOR STUDENTS

5.2.1 Computing Student Organization Creation

Students cited in surveys and interviews that feelings of isolation and a lack of community were present within the CS Department. Many interviewees mentioned that other programs and departments have general clubs to promote major-related activities, such as the DS program having a DS Club. Creating identity-based computing clubs to support marginalized groups may also improve student experience.

5.2.1.1 General CS Student Organization Creation

Though ACM does exist as an organization at WPI, the professional-based nature of the club gives it a different atmosphere than a generalized computing club. Creating a general computing, specifically CS, club will be important for students to connect with other members in

their major in a relaxed, non-professional setting. We recommend that students create an interest group for an executive board and then go through the formal process for club creation with the assistance of newer clubs like DS Club or WiCyS. Making this process mostly student-led is important to making sure the atmosphere of the new organization matches what students want. Once students have worked to gather a general executive board, the process for creating a club depends on a few factors. The club must rely on funding requests and CS Department support until it becomes a fully-incorporated club eligible for budget approval through the Student Government Association (SGA), which will take 2 years. Though this is a rather large commitment time-wise, student executive board members will share the workload and role transitions will also assist this process.

5.2.1.2 LGBTQ+ Computing Student Organization Creation

A discussion on major-based club creation also brings up the need for more major-based groups for marginalized students. Several clubs exist for certain marginalized groups; WiCyS, WiCS, and WiDS support women in specific computing majors, the Society of Women Engineers supports women in engineering, and the Society of Asian Scientists and Engineers (SASE) supports Asian students in engineering. However, there is no space dedicated to LGBTQ+ students in computing specifically. Students in interviews mentioned clubs as a place to connect with fellow students in marginalized groups within their disciplines and cited these experiences as creating a sense of community.

Though a lack of community was common in students across the board, creating a space for students in the LGBTQ+ community could significantly assist queer students in finding their own community within computing. Transgender and non-binary students suffered in several areas of community, especially when looking at support and open-mindedness of the CS

Department, and building a group to connect and give help to CS students identifying as a member of the LGBTQ+ community may help to alleviate these feelings. The process for creating the club would be similar to the above-mentioned process for the creation of a general CS student organization. The club may benefit from the additional assistance of the Alliance student organization (WPI's oSTEM affiliate) and the ODIME center during its creation.

5.2.2 Improvements to Current Computing Organizations

The team only interviewed CSC, but this discussion gave valuable insights on what the organization wanted to improve that could assist other computing organizations in reaching their goals and increasing engagement. One of the major difficulties CSC and other student organizations at WPI experience is a sharp drop in attendance after the first semester. Increasing student engagement in the terms that historically have fewer students in attendance may help curb this issue. A potential way to do this would be through increasing and diversifying advertisements with the assistance of the CS Department. This could include creating TechSync events, printing flyers for various campus buildings, posting on WPI's general Discord server, and having professors announce particularly interesting club meetings. Fellow student organizations could also advertise special events clubs run to widen the audience exposed to information.

Doing collaborations may also boost engagement for all organizations involved in the later half of the academic year. These collaborations could be with computing or non-computing organizations, computing departments, and campus resource centers like the Career Development Center (CDC) or the Center for Well Being (CWB). This may increase interest and help students continue with club commitments throughout the year instead of just at the

beginning. Timing certain collaborations with major WPI events may help as well. For example, having a CDC collaboration event before a career fair may bring more people to a meeting.

5.2.3 Major-Based Discord Improvements

Discord is a common method of communication between students at WPI, and the creation and use of major-based Discord servers is important to a sense of community among students. The CS Discord server seems to be underutilized and less organized than Discord servers of other majors at WPI. As of right now, the server is mainly used for light discussion and class help, but it has potential to be a community hub where CS students and faculty connect. This can either be done by restructuring the server itself, or creating a new server altogether by students. Some servers are run by faculty rather than students, but as the CS Discord server was created for students, it should remain as such. However, it would make the server more useful if it were a place for students and faculty to connect in a more casual setting than during lecture time or office hours. Faculty members could be given a faculty role and students could be given a student role, with individuals with no roles having limited access to the server. Channels could be made for only students to ensure that students have a "safe space" to discuss issues and have a more casual hang-out space. These changes and more can be discussed among the moderation team with input from the server members and members of other moderation teams.

After restructuring the server, it should be advertised to the CS student and faculty population to ensure all members of the CS community have access to it as a communication hub and resource center. Computing student organizations should also let students know about the server and can contribute to it by utilizing the currently-available #cs-events channel to increase engagement. Instructors could also find ways to integrate their own course discord servers with

this main server – having this main CS server creates the bridge between courses that currently does not really exist.

Making the necessary changes to the server may take several months, especially with the recommended community input at every stage of changes. However, once it is updated, the server would only require the usual amount of maintenance to ensure it is updated in the future to meet the needs of the CS community. A successful Discord server will be active and discussed by students as a useful resource to talk about classes, get information on what courses to take, and more.

5.3 RECOMMENDATIONS FOR FACULTY

5.3.1 Research Opportunity Advertising

Student-faculty relationships are important to the success of students in computing majors. Research is a major way to facilitate this relationship while benefiting both parties through work. There are many research opportunities available to students, but many are not advertised well enough for interested individuals to engage with them. Students often have to reach out to professors after looking at their faculty profiles to understand their specific research interests, which creates several hurdles for them to overcome to have a successful start to their research experience. Some professors do email the computing student body to advertise research opportunities, especially those involving IQP and MQP assistance, but the desired qualifications are often discouraging to students who don't yet have research experience. Our student interviews indicated that professors must encourage research opportunities in a way that students with little experience can feel comfortable engaging with the experiences while assisting with

research in a useful way. Building student confidence and community through research is important to bettering the student experience.

To do this, having faculty actively advertise their research opportunities to students during classes, emailing the CS student body with potential research opportunities requiring varying levels of experience, and adapting current research projects to allow for students with minimal research experience to participate would increase student comfort and participation. Research is often a path to graduate school thesis work, so talking with students about why research is important would also help to improve participation and strengthen faculty-student relationships.

5.3.2 Student Coursework Collaboration Improvements

As of right now, most students who filled out our survey preferred individual work to collaborative work regardless of identity, though marginalized groups regularly had more issues with partner work when compared to white males. Many respondents cited feeling pressured by partners into doing too much work and a lack of respect and support from their partners, with these statistics being more exaggerated in marginalized groups. Students are often randomly assigned project partners, especially in introductory courses. While this does relieve some pressure in having friends or acquaintances in the course to partner with, random assignment has resulted in several negative experiences for students. Some students in interviews mentioned that most of their project partner assignments resulted in issues that may or may not have affected their performance in the course.

Some higher level courses like Software Engineering work to create pairings between students based on prior skill level and other factors. Creating a pairing system like this for introductory-level courses will help improve the partnership experience. The system could look

at previous programming experience, major, working hours, and other factors that could be generated by focus groups to understand what students need for successful group partnership beyond what was studied in this paper. It could be a way for professors to select factors that they believe will be the most important to have in common for success in group work. This system could be created with input from a small group of students to ensure that it's helpful for students while also being easy for professors to implement during classes. Ideally, it would be automated based on the InstructAssist or Canvas system so that professors would not have to do too much additional work to create this.

Creating and implementing this matching system will certainly take some time to do correctly. Getting a group of students and professors together to start talks on what the final product will look like would be the first step. After this, creating the actual program will not take long, no longer than a couple months until the testing phase. When testing is complete, professors will need to be educated on how to use the system to create matches for students. Through a series of resource guides and a few meetings, most professors should be able to effectively use the system within one term.

5.3.3 Advising Program Adjustments

Most students in interviews indicated they either didn't know their faculty advisors, or found them incredibly unhelpful when it came to receiving help on course decisions and department-wide opportunities. This sentiment is echoed in the survey results as well. Advising is integral to student confidence and success, and is an important aspect of students feeling supported by the CS Department. Currently, faculty advisors may reach out to students through email upon being assigned them at the end of freshman year. This does not seem sufficient. As mentioned before, faculty-student relationships are important, and the advising

program could be a great way to facilitate these. Instead of simply meeting with students once per year to confirm graduation requirements, students and advisors can meet two or three times per academic year to discuss the student's progress in curricular and extracurricular happenings, potential internship or scholarship opportunities, and other topics to build rapport and give students access to more resources available as a student in computing. The current system of having advisors reach out once and then having the rest of the advising experience be student-led has not been working, so having advisors reach out to initiate this meeting would encourage more students to respond and release them from the pressure of reaching out themselves.

Students also mentioned that their advisors weren't necessarily helpful to their specific major interests; if a student is interested in CyS, it would not be as beneficial for them to have an advisor that is only interested in another topic. However, it would be largely improbable for all students to receive an advisor that directly lines up to their specific interests, and some students are exploring CS without a specific focus until later on in their career. Though this aspect would be more of a departmental collaboration, ensuring students are able to have an advisor that best supports them is important to making sure they don't miss opportunities they otherwise would have had a chance to apply for or attend with an advisor more knowledgeable in their field.

5.4 RECOMMENDATIONS FOR CS DEPARTMENT

5.4.1 Course Infrastructure Redesign

Right now, most courses are isolated from each other and don't transition smoothly, despite courses being listed as prerequisites or being recommended by advisors. The courses can vary from programming language to IDE to even virtual machine setup, and while it is valuable to have experience with multiple of these facets, the translation of knowledge between classes is

sometimes lost, even having courses that use similar programming languages which have to use a completely different virtual machine setup. Many students spoke about a knowledge gap in between courses that left them feeling unprepared to tackle coursework, leading to students noting feelings of coursework being too challenging or their self-confidence in CS being noticeably diminished.

The way each course sets up their own development environments is often up to the instructor's discretion (which can sometimes be archaic or unfamiliar) or the student's discretion (unguided, requires significant knowledge to navigate setup process). There is also some inconsistency between students of different computing backgrounds, and the AP Computer Science A course taken in high school is completely useless toward CS course requirements under the current system, making students repeat material that was already taught during the CS2102/2103 courses. A lot of time is often wasted on courses repeating the knowledge already learned through prior experience, and simply going through the motions for course credit/advanced course prerequisites, as opposed to learning new knowledge that is genuinely engaging.

There are a few changes that can be implemented to improve this. First, the CS Department should seek to centralize the coding infrastructure in a way that allows for a universal standard between courses. For example, if multiple courses use the same language, it should be possible for the student to use the same or similar virtual machine setup across all those courses. In addition, students should be given resources to easily see the technical requirements for a course, including what language is used, what computing elements are required, so that if a student is unfamiliar with the particular language, they are able to prepare ahead of the course to translate their skills into that language or system through other online resources or tutoring. This could be

done as a resource hub either in InstructAssist, the WPI Hub, or a completely different service. It might take an year or two to fully standardize all of the courses in a way that makes sense, but this would reduce a lot of the time wasted on transitioning from a setup to another setup, or a language to a different language, etc, as well as let instructors be more confident about not having to repeat redundant course content and being able to jump straight into the actual instruction, with all students on the same page.

Second, the CS Department should incorporate some sort of placement test for how students understand computer science concepts. This would be similar to the math placement test, where students are given credit for introductory calculus courses that they might not have taken, but they have the knowledge regardless, and students are free to explore higher concepts by their second semester after having finished Calc IV, which leads to already taking advanced 3000-level, 4000-level courses by sophomore year most of the time. Given that CS is much less linear with no comparable track to the calculus track, there may be some difficulties in exactly understanding how to navigate which courses the placement test counts for, but it should be integrated to improve the current system. Many CS students are knowledgeable on certain CS concepts going into the track as a first-year student, and instead of holding them back by not counting their AP credits and forcing them to take an introductory course where the only unfamiliar element is a foreign programming language, students should be allowed to get credit for the knowledge that they clearly demonstrate, and be able to explore much higher-level courses sooner. CS students seem to find the higher level courses much more interesting, and it is important to let them explore where their interests lie as early as possible, rather than delaying it through forcing students to take courses that everyone takes anyway. Students find more familiarity in smaller and more advanced but interesting courses, and community can be

developed in these spaces rather than large lecture halls of over a hundred people. Giving CS students the opportunity to tackle higher-level courses earlier can only be a good thing for the community and for student interest in CS as a whole.

5.4.2 CS Tutoring

We already know that CS is low on human resources, so much so that they have begun to rely on technology instead to lighten the burden. Most of the student assistants are for the introductory courses, CS 1101/1102. This creates a problem where SA office hours are clogged up with students lined up in queue to tackle debugging problems, and the department finds that they need more and more people to assist these intro courses. There is a large time sink in this regard. The Math Department had a similar issue with students taking calculus courses and requiring extra support which tutoring services and teaching staff could not successfully address due to the sheer amount of assistance needed. Their solution was the Math Tutoring Center. This is open all day with student-centered hours. Students can walk in and ask for help as long as they want, with tutors switching in and out to continue assisting. These tutors are usually PLAs or TAs as well, but there is no requirement for these assistants to be assigned to that particular section or class.

CS would benefit from having a Computer Science Tutoring Center, or a similar space for students taking introductory CS courses to go to get CS-based help. This gives a centralized place for all students with issues to gather, find resources, and have a knowledgeable person to help. This is much more beneficial for SAs who no longer have to do hours of support at a time through online forums and office hours, instead having a slot at the tutoring center where they can tackle any problem. Students are also able to have multiple perspectives if one SA ends up being less knowledgeable about their particular problem. While a physical location would be

best, this is also possible to operate online given the nature of CS. As long as students have one location where they can reach out to any SA available, time constraints of adhering to only SA office hours are much more manageable. There is also another resource in the Academic Resources Center. While this is much more general, there is still a valuable resource that so few students are using. Instructors should list the ARC as a valuable resource for help as well. If these two advances were made, there would be a much better efficiency in terms of time put into support and grading.

5.4.3 Peer Mentorship Program

For the most part, CS students seem to not have a lot of guidance regarding which topics they want to pursue. CS students are often just told which courses to take, given that they are useful prerequisites or course requirements, and then from there on, the onus is on the student to choose what interests them, even when students have no idea what they want to pursue. Instead of working within the previously-discussed advising system, students stated in interviews that they had success seeking out peers and upperclassmen to discuss course plans and other opportunities. Some student organizations were also mentioned as providing an advising system for finding which courses to take. Students not in clubs or without connections miss out on valuable advising experiences that are vital to success in finding a path in CS they are satisfied with, and the number of students experiencing isolation and a lack of community is high in computing.

Providing a mentorship program would be really helpful to these students. Some students might feel a lot more pressured to talk to professors, not sure if the professor is familiar enough in the subject to offer proper guidance and feeling the lack of community between peers and professors. Having a peer mentor would be a confidence booster for both finding academic

interest in CS, but also finding opportunities outside of coursework, including internships and research.

The CS Department did conduct a mentorship program for the first semester of 2022, and while results are still being calculated, the number of students who stayed through the program is an indicator of the overall interest in the program. This program was trialed for freshman only, so expanding this to sophomores and juniors as well may assist with transitioning to a robust mentorship system. This system can also be expanded to other computing programs. Including graduate students as potential mentors and having a matching system similar to the current system through Qualtrics forms would potentially help upperclassmen with research interest and potential transitions to WPI's graduate program. Similar to the advising program, it would be useful for students and mentors to share areas of focus within computing to maximize the utility of the peer mentorship program. As the framework for a mentorship program is available already through this trial program, implementing a larger program should only take one or two terms to create and distribute information to students about. Working with students in the mentorship program previously would help improve anything before shipping its final version to the general computing community so that other majors can implement it as well. This may take multiple terms as well, as some departments have never implemented mentorship programs and may need extra guidance on where to start and recruit student mentors.

5.4.4 Improving Fuller Commons

Right now, Fuller Commons is rarely visited by computing students for longer than waiting periods while Fuller Upper or Fuller Lower classes get out. Those who do visit it only do it once in a while. There is not a lot of incentive as a social space, and academically, students have many other options to work in, including virtually, since the nature of computing allows for easy online

collaboration. Fuller Commons was meant to be a social space designed to bring the community together, but it does not serve that purpose right now. Some of the main causes determined by survey results and student interviews are: no incentive to be there since CS majors rarely go there, the space's reputation as a waiting area or working space instead of a social area, and the presence of people outside the major using the space for waiting.

Opening up the space to have more interesting, regular events happen would really help it get going, like UPE's BTMO event. Fuller Commons has the potential to be a casual space designed for academic experience that is not necessarily chained to course content. This would be the perfect space to explore extraneous content, such as CS puzzles, bounties, and interdisciplinary projects. It gives students an incentive to participate, and it removes the pressure of academic work from the place, turning it into more of a lounge space where students are able to participate more in the extracurricular aspect of the department. In addition, professors should be incentivised to visit, and the space should serve as a way for students and faculty to talk on equal grounds. Currently, the only real way to talk to faculty is either in passing, after the course lecture concludes, or the professor’s office during office hours. The first case only happens by coincidence, while the latter few cases often puts the pressure on the student to have some sort of demand or cause to talk to the professor. In our suggestion, faculty staying in the Fuller Commons space doesn’t serve as anything specific for student-faculty hierarchy, and it can be more of an exchange between students, where there is no immediate need to have a conversation due to academic work, other than just genuine interest in the subject. This would help create more community with students, as well as demystify the barrier between students and faculty that currently exists.

Implementing new programs for Fuller Commons could be done in collaboration with students, faculty, and WPI as a whole. Student organizations can also participate in making the space more welcoming through collaborations with the department or other involved parties. Depending on the level of support given to this task, building a strong calendar of events with budgeting, room reservations, and activity or program ideas could take anywhere from a month to an entire term. Inviting professors to come to the space and advertising the space to students as a place for all individuals interested in CS to enjoy and speak on the same level may take several months, as undoing the current perceptions around Fuller Labs held by students will require time.

5.4.5 Teaching Staff and Faculty Diversity

There is a striking lack of diversity among teaching staff. Students in marginalized groups have repeatedly reported that they do not feel strongly represented when it comes to faculty or student staff, and this leads to students having only one or two figures that they can properly identify with and confide in. In interview discussions, it was pointed out that when a student finds a teaching staff member, particularly a professor, they identify with, their entire WPI experience is uplifted and they feel more supported than they did prior. There needs to be a change, where students can be more comfortable in opening up to professors based on identities that they can connect with, as well as opening up that conversation so that faculty can be supportive and vocal about these issues that people face, regardless of their identity. Psychographics are a large piece of how students actually feel connected to faculty and understanding whether or not a faculty member truly is on their side, and seeking to open that conversation up is the only way forward, otherwise the diversity of the department simply goes further and further back.

5.5 CHANGES TO THE EXPERIENCE OF DISABLED STUDENTS

Students with disabilities fared significantly worse in almost all areas discussed in the Data and Analysis section, from collaboration in coursework to community engagement. While this is not a statistic that will translate to the larger WPI population without additional research, having so many disabled computing students with noticeably more difficult experiences is concerning. Support for these students is essential to making sure they can succeed in their studies, whether this be through technical and logistical support, or through community outreach and acceptance, both issues that currently remain unresolved for students.

When asked about support systems that worked well over the pandemic that should be continued, many students, able-bodied and disabled, cited recorded video lectures. This is something the team would like to see continue, as well as the addition of video transcripts or subtitles. While they do not have to be precise, they should be accurate enough such that any student can comprehend the content of the lecture material with guidance of supplement material. Many professors have stopped lecture capture, citing an increase in difficulty for them, but this slight increase in difficulty for lecturing may completely alter the experience of a student with a disability while assisting able-bodied students too.

We are not experts on this subject, and thus we cannot list every single complaint that disabled students have with the current WPI system, so instead, we urge WPI and the CS Department to reach out to disabled students and ask what exactly would help them succeed specifically. People who would be knowledgeable about this would be the Office of Accessibility Services, as well as the Student Development and Counseling Center. Resources should be provided such that any student who is disabled, invisible or not, should be fully capable of pursuing a degree at WPI without having to create unique exceptions for that student and that

student alone. In contrast, a failure point would be if a student finds that WPI is unable to sufficiently provide for them, they then leave the school as they cannot continue under the current system. Addressing disabilities only lowers the barrier of entry to studying at WPI, and while it may take a long time for the institution to develop the proper resources, the team believes it is possible to support that without forcing professors to make extra workarounds for special cases.

6 CONCLUSION

The goal of the project was to identify issues with current DEI practices in computing departments and programs at WPI to encourage a more welcoming, supportive, and encouraging environment for all students. After conducting a survey and several interviews, the team created a list of recommendations for students, faculty, computing departments, and WPI as a whole.

6.1 MAIN ISSUES IDENTIFIED

Through the survey and interviews conducted with students in computing majors, a few major issues were identified as negatively impacting student experience:

1. Lack of community and a feeling of isolation among students not involved with student organizations already
2. Need for student organization support and physical and online community spaces for peers and faculty members to connect in a casual member
3. Underutilized advising program and lack of official mentorship program for all computing students leading to less amounts of student support
4. Problems with collaborative work, failing course infrastructure, and disconnected course progression causing student frustration and stress

6.2 RECOMMENDATIONS

6.2.1 Recommendations for Students

1. Create a general non-professional computing student organization to create a sense of community among all CS students and make a forum for casual discussion and connection-building

2. Create an LGBTQ+ centered student organization to uplift members of this marginalized group and increase students' sense of community
3. Improve student organizations through increased advertisements and collaborations among clubs and departments to increase retention and engagement throughout the entire academic year
4. Restructure the current CS Discord server to be a welcoming, informative resource and space for students, teaching staff, and faculty to connect in a non-professional setting

6.2.2 Recommendations for Faculty

1. Reorganize research opportunities, when possible, to be welcoming to students with less research experience and advertise these opportunities to students through announcements
2. Develop a student partner pairing system with assistance from students for more successful and fulfilling collaboration experiences
3. Reach out to students first to initiate the advising process and be active throughout the advising process; participate in the creation of a student-advisor matching program

6.2.3 Recommendations for Computing Departments

1. Redesign course transition requirements to ensure students are prepared for coursework and create a semi-universal infrastructure for teaching classes and for virtual machine setup to make the start of courses more smooth
2. Implement a CS tutoring system for introductory courses with inspiration from the Math Department to make a centralized resource for course help

3. Further develop the current CS Department peer mentorship program to include upperclassmen (not just freshmen) and work with other computing departments and programs to implement their own mentorship programs
4. Improve Fuller Commons as a common space for computing majors by collaborating with student organizations on events in the space and working to undo the current perceptions of the area as for coursework only
5. Increase teaching staff and faculty diversity to better represent the student body
6. Continue conducting studies and interviews through IQPs and other projects so that the practices of each department are in line with what students need

6.2.4 Improving the Experience of Disabled Students

The team also wanted to mention some potential solutions for the issues disabled students face, for collaboration from students, faculty members, departments, and WPI as a whole:

1. Make recorded lectures through Echo360 or Zoom mandatory and ensure subtitles and transcripts are available if needed
2. Work with the OAS and SDCC to address student needs in a holistic way

These recommendations were given with timelines for completion, potential collaborations, and other information necessary to implement each successfully. We hope that once implemented, these recommendations benefit students, staff, and faculty members from all groups by creating a more welcoming, supportive, and exciting environment to learn, research, and work.

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8 APPENDICES

8.1 Appendix A: Copy of Survey Questions

1 GENERAL BACKGROUND

1Q1 What semester did you start taking courses at WPI in?

a. Spring 2018
b. Fall 2018
c. Spring 2019
d. Fall 2019
e. Spring 2020
f. Fall 2020
g. Spring 2021
h. Fall 2022

1Q2 When are you planning on graduating with your undergraduate degree?

a. 2022
b. 2023
c. 2024
d. 2025
e. 2026
f. 2027+

If 1Q1 Response is not Fall 2022 (A, B, C, D, E, F, G): [

1Q3 What is your major? Check all that apply.

- ☐ Computer Science
- ☐ IMGD
- ☐ RBE
- ☐ DS
- ☐ BCB
- ☐ Other (please specify):

]

If 1Q1 Response is Fall 2022 (H): [

1Q4 What is your intended major? Check all that apply.

- ☐ Computer Science
- ☐ IMGD
- ☐ RBE
- ☐ DS
- ☐ BCB

- ☐ Undecided
- ☐ Other (please specify):

]
If 1Q3 Response is Computer Science: [
1Q5 Are you currently pursuing the Cyber Security concentration?

a. Yes
b. No

]

1Q6 How many Computer Science courses have you taken so far, if any?

a. 0
b. 1
c. 2
d. 3 or more

1Q7 How many more Computer Science courses do you plan to take?

a. 0
b. 1
c. 2
d. 3 or more

1Q8 Do you have a job unrelated to your major? We will ask about related experiences later on. Check all that apply.

- ☐ Yes, off-campus.
- ☐ Yes, on-campus.
- ☐ No, I do not have a job unrelated to my major.

1Q9 Are you involved with Greek Life on campus?

a. Yes
b. No
c. Rushing/Going through recruitment this year

2 COMPUTER SCIENCE BACKGROUND
2Q1 Did you take AP Computer Science A in high school?

a. Yes
b. No

2Q2 Did you take non-AP Computer Science courses in high school?

a. Yes
b. No

2Q3 Did you take online/extracurricular courses for Computer Science not in your high school curriculum?

a. Yes
b. No

2Q4 Have you worked on extracurricular CS projects (not related to coursework)?

a. Yes
b. No

2Q5 Which of the following opportunities did you engage with after becoming a student at WPI? Check all that apply.

- ☐ Internship
- ☐ Co-Op
- ☐ Undergraduate research
- ☐ On-campus job related to your major
- ☐ Off-campus job related to your major

If IQ6 Response is not 0 (B, C, D): [
2Q6 Overall, what selection most closely resembles your grades in CS courses?

(1) Mostly As
(2) Some As and Bs
(3) Mostly Bs
(4) Some Bs and Cs
(5) Mostly Cs

If IQ3 is not Computer Science: [
2Q7 Overall, what selection most closely resembles your grades in major-related (not CS) courses?

(1) Mostly As
(2) Some As and Bs
(3) Mostly Bs
(4) Some Bs and Cs
(5) Mostly Cs

]
]

3 TECHNOLOGY BACKGROUND
3Q1 What device do you do most of your coursework on?

a. Laptop

b. Desktop Computer
c. WPI Lab Computer
d. Tablet
e. Other:

3Q2 Was there ever a time when your device encountered serious issues working (ex. blue-screening, won't turn on, cracked screen)?

a. Yes
b. No

If 3Q2 Response is Yes (A): [
3Q3 Where did you go for an alternate device? Check all that apply.

- ☐ I had a secondary device
- ☐ WPI IT Office
- ☐ WPI Computer Science Department
- ☐ Friends
- ☐ Family
- ☐ Other
- ☐ I didn't

3Q4 Were you able to complete your coursework despite the technological issues?

a. Yes
b. No

3Q5 When was the last time you had these technological issues?

a. Spring 2018
b. Fall 2018
c. Spring 2019
d. Fall 2019
e. Spring 2020
f. Fall 2020
g. Spring 2021
h. Fall 2022

]

3Q6 How often do you use WPI Lab computers for coursework?

(1) Not at all
(2) Rarely
(3) Occasionally
(4) Frequently

(5) All the time

If 3Q6 is not 1 (2, 3, 4, 5): [
3Q7 What purpose do you use WPI Lab computers for? Check all that apply.

- ☐ Adobe Suite (Photoshop, PDF Reader, etc.)
- ☐ IMGD projects
- ☐ MATLAB
- ☐ Other:

3Q8 When was the last time you used the WPI Lab computers?

a. Spring 2018
b. Fall 2018
c. Spring 2019
d. Fall 2019
e. Spring 2020
f. Fall 2020
g. Spring 2021
h. Fall 2021
i. Spring 2022
j. Fall 2022

]

GENERAL COMPUTER SCIENCE DEPARTMENT
4Q1 How would you rate your Computer Science abilities compared to that of your peers?

(1) I have much fewer skills.
(2) I have somewhat fewer skills.
(3) I have the same skill level.
(4) I have somewhat more skills.
(5) I have much more skills.

4Q2 What beliefs listed below, if any, do you think people generally have about Computer Science? Check all that apply.

- ☐ CS is too difficult for most people.
- ☐ CS is too time-consuming to learn.
- ☐ CS is not appropriate for women.
- ☐ CS is not appropriate for men.
- ☐ A person has to give up outside interests to study or work in CS.
- ☐ CS practitioners have trouble in social interactions.
- ☐ People only work in CS for money.

4Q3 What statements about your own personal feelings being involved with your department are true? Check all that apply.

- ☐ I feel like a part of my department.
- ☐ I control my own experience in my major.
- ☐ Students in my major are supportive.
- ☐ Students in my CS courses are supportive and encourage each other to succeed.
- ☐ Students in my CS courses regularly show off their talents during lecture time.
- ☐ I feel that my professors handle students showing off well in my courses.
- ☐ My identity does not hinder my success in my courses.

4Q4 Which of the following words describe the general atmosphere of the CS Department, in and out of classes? Check all that apply.

- ☐ Friendly
- ☐ Encourages asking for help
- ☐ Too focused on academics
- ☐ Community-oriented
- ☐ Individualistic
- ☐ Differences of opinion are respected
- ☐ Open-minded
- ☐ Fun
- ☐ Supportive
- ☐ Collaborative
- ☐ Welcoming
- ☐ Isolating
- ☐ Boring
- ☐ Intellectually stimulating
- ☐ Competitive
- ☐ Students are all treated the same
- ☐ Performance-driven
- ☐ Listens to student feedback
- ☐ Too hard/challenging
- ☐ Easy to reach

4Q5 What, if any, are CS courses that have a reputation for negative experiences?

_____

4Q6 What, if any, are CS courses that have a reputation for positive experiences?

_____

If 1Q3 Response is not Computer Science and not Undecided: [
5 ADJACENT MAJOR QUESTIONS
5Q1 In your opinion, how much does the content of CS courses help with your major?
(1) Not at all
(2) A little
(3) Somewhat
(4) Mostly
(5) Completely

5Q2 How much time do you spend on CS coursework compared to major-specific courses?
(1) Significantly less time spent on CS work
(2) A little less time spent on CS work
(3) The same time spent on CS work
(4) A little more time spent on CS work
(5) Significantly more time spent on CS work

5Q3 How prepared did/do you feel for your CS coursework?
(1) Not at all
(2) A little
(3) Somewhat
(4) Mostly
(5) Completely

5Q4 Are you planning on taking Software Engineering to complete requirements for your major?
a. Yes
b. No
c. Unsure

If 5Q4 Response is Yes (A): [
5Q5 How prepared did/do you feel about taking Software Engineering?
(1) Not at all
(2) A little
(3) Somewhat
(4) Mostly
(5) Completely
]
]

DISCORD QUESTIONS

6Q1 Are you involved in the Discord community for your major?

a. Yes, I am a regular poster.
b. Yes, I keep up to date on posts regularly.
c. I am a member but am inactive and rarely keep up to date on posts.
d. No, I am not a member.
e. I do not know if my community has a Discord.
f. I do not use Discord.

If 6Q1 Response is Yes (A, B, C): [

6Q2 How connected do you feel with your major's community through Discord?

(1) Very disconnected
(2) Somewhat disconnected
(3) Neither connected nor disconnected
(4) Somewhat connected
(5) Very connected

]

7 COMPUTER SCIENCE CLUB INTERACTIONS

7Q1 Do you consider yourself an active member of any of these organisations? Check all that apply.

☐ Association of Computing Machinery (ACM)
☐ Bioinformatics and Computational Biology Club
☐ Cyber Security Club (CSC)
☐ Data Science Club
☐ Diversity in Games (DIG)
☐ International Game Developers Association (IGDA)
☐ Rho Beta Epsilon (RBE)
☐ Upsilon Pi Epsilon (UPE)
☐ Women in Computer Science
☐ Women in Cyber Security
☐ Women in Robotics Engineering
☐ Other major-related club: _____

8 COMPUTER SCIENCE COURSE INTERACTIONS

8Q1 Do/did the introductory CS courses make you more interested in CS? (1101, 1102, 2102, 2103)

a. My interest has increased in CS after taking an introductory course.

b. My interest has decreased in CS after taking an introductory course.
c. My interest level has not changed.

8Q2 Which of the following statements holds true about introductory CS course labs? Check all that apply.

- ☐ Labs are frustrating.
- ☐ Labs are interesting.
- ☐ I would prefer having lecture time instead of lab time.
- ☐ I collaborate with others during lab time.
- ☐ Labs are a waste of time.
- ☐ Student assistants provide good direction and support during lab sessions.
- ☐ Attending lab increases my course understanding.
- ☐ Attending lab makes me feel more confident about course material.

8Q3 How do you feel about collaboration on CS projects and assignments? Check all that apply.

- ☐ Collaboration increases my understanding of course material.
- ☐ Collaboration makes coursework easier.
- ☐ I have had a bad experience with a partner that hindered my work.
- ☐ I feel pressured by a partner doing more work than they should.
- ☐ I feel respected by other students during collaboration.
- ☐ I feel supported by my peers when collaborating.
- ☐ I have made friends from collaborating with other students.
- ☐ I prefer collaborative assignments over individual assignments.

8Q4 Who do you go to when you need assistance with coursework?

- ☐ Professor office hours
- ☐ SA/TA office hours
- ☐ Friend who has taken the class previously
- ☐ Classmate currently taking the course
- ☐ Student organisations
- ☐ ARC Tutoring
- ☐ Family member
- ☐ Outside tutoring
- ☐ Nobody

If 8Q4 Response is only Nobody: [
8Q5 What are some reasons, if any, for not seeking help?

- ☐ Not enough time

- ☐ Embarrassment
- ☐ Didn't need to
- ☐ Other:

]

9 COMPUTER SCIENCE FACULTY INTERACTIONS

9Q1 How often do you find that professors listen to you?

(1) Very rarely
(2) Not often
(3) Sometimes
(4) Most of the time
(5) All the time

9Q2 How often do you find that professors want to help you?

(1) Very rarely
(2) Not often
(3) Sometimes
(4) Most of the time
(5) All the time

9Q3 How available are professors for office hours?

(1) Not available at all
(2) Rarely available
(3) Somewhat Available
(4) Mostly available
(5) Always available

9Q4 How helpful have you found your faculty advisor?

(1) Not helpful at all
(2) Very unhelpful
(3) Somewhat helpful
(4) Very helpful
(5) Extremely helpful

9Q5 How much do you feel represented by members of the faculty in the CS Department in the following categories?

Race

(1) Not at all represented
(2) Not represented very much

(3) Somewhat represented
(4) Very represented
(5) Extremely represented

Ethnicity
(1) Not at all represented
(2) Not represented very much
(3) Somewhat represented
(4) Very represented
(5) Extremely represented

Gender
(1) Not at all represented
(2) Not represented very much
(3) Somewhat represented
(4) Very represented
(5) Extremely represented

Sexuality
(1) Not at all represented
(2) Not represented very much
(3) Somewhat represented
(4) Very represented
(5) Extremely represented

9Q6 Do you feel represented by student staff (ex. SAs, TAs) in the CS Department in the following categories?

Race
(1) Not at all represented
(2) Not represented very much
(3) Somewhat represented
(4) Very represented
(5) Extremely represented

Ethnicity
(1) Not at all represented
(2) Not represented very much
(3) Somewhat represented
(4) Very represented

(5) Extremely represented

Gender
(1) Not at all represented
(2) Not represented very much
(3) Somewhat represented
(4) Very represented
(5) Extremely represented

Sexuality
(1) Not at all represented
(2) Not represented very much
(3) Somewhat represented
(4) Very represented
(5) Extremely represented

9Q7 When there was an emergency situation, how willing were professors to work with you to move deadlines or otherwise provide assistance? (1-5)
(1) Not willing at all
(2) Very unwilling
(3) Somewhat willing
(4) Very willing
(5) Extremely willing
(6) N/A

9Q8 Rate the following statement: when there was an emergency situation, I felt comfortable asking my professor for accomodations. (1-5)
(1) Not comfortable at all
(2) Very comfortable
(3) Somewhat comfortable
(4) Very comfortable
(5) Extremely comfortable
(6) N/A

10 TRACKING DEPARTMENT FEEDBACK
10Q1 How regularly do you use Fuller Commons?
(1) Never
(2) Once per term
(3) Once every two weeks
(4) Once a week

(5) Most days

If 10Q1 Response is greater than 1 (2, 3, 4, 5): [
10Q2 What do you mainly use Fuller Commons for?

a. Social
b. Academic
c. Club Activities
d. Other

]

10Q3 When you have concerns with the Computer Science department, what communication channels do you use, if any? Check all that apply.

- ☐ Visiting the Department Head's office
- ☐ Writing an email to the Department Head
- ☐ Post in online forums such as Reddit or Discord
- ☐ No communication channels
- ☐ Other: _____

11 STUDENT IDENTITY
11Q1 How do you describe your gender identity? Check all that apply.

- ☐ Male
- ☐ Female
- ☐ Nonbinary
- ☐ Prefer to self-identify:
- ☐ Prefer not to disclose

11Q2 Do you identify as transgender? The team wants to specifically look at the experiences of those who identify as transgender and how they differ than those of cisgender individuals.

a. Yes
b. Questioning
c. No
d. Prefer not to disclose

11Q3 Are you an international student?

a. Yes
b. No

10Q4 Are you the first in your family to attend college?

a. Yes
b. No

11Q5 What would you best describe yourself as? Check all that apply.

- ☐ Black
- ☐ Afro-Caribbean
- ☐ African
- ☐ Indigenous
- ☐ Native
- ☐ First Nations
- ☐ Latina/o/x/e
- ☐ Hispanic
- ☐ White
- ☐ European
- ☐ East Asian
- ☐ South Asian
- ☐ Southeast Asian
- ☐ Middle Eastern
- ☐ Western Asian
- ☐ Multiracial/Biracial/Transracial
- ☐ Prefer not to disclose
- ☐ Prefer to self-describe: _____

11Q6 Do you self-identify as having a disability?

a. Yes
b. No
c. Unsure

If 11Q6 Response is Yes (A): [
11Q7 Do you have a physical disability?

a. Yes
b. No

11Q8 Would you consider your disability an “invisible disability,” meaning that other people may not see your disability externally?

a. Yes
b. No
c. Unsure

]

12 FINAL QUESTIONS

12Q1 Would you be interested in entering in the raffle? If so, please include your contact information below so we can reach out.
Email: _____

12Q2 The team is interested in conducting interviews and focus groups to expand on students' experiences. Would you be interested in elaborating on your experiences described in the survey?

a. Yes
b. No

If 12Q2 Response is Yes (A): [
12Q3 Please include your contact information.

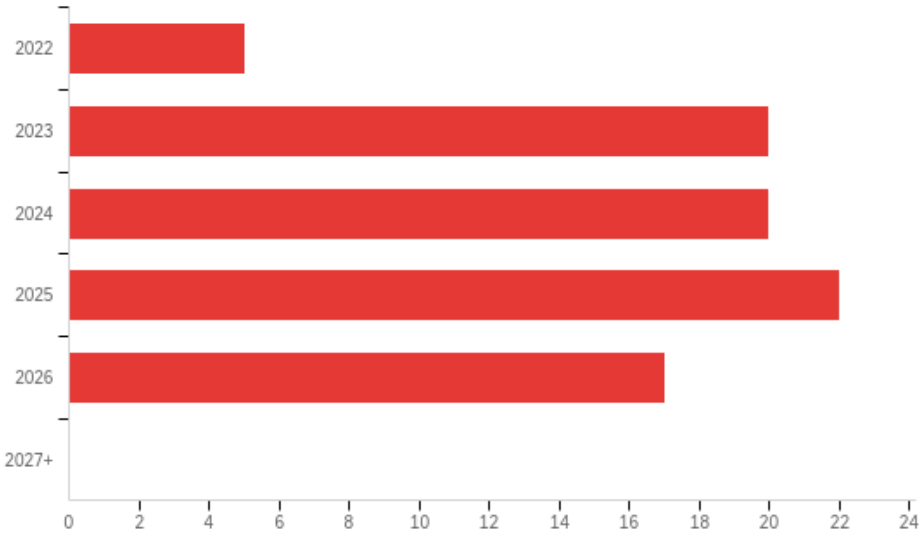
_____
]

8.2 Appendix B: Survey Data

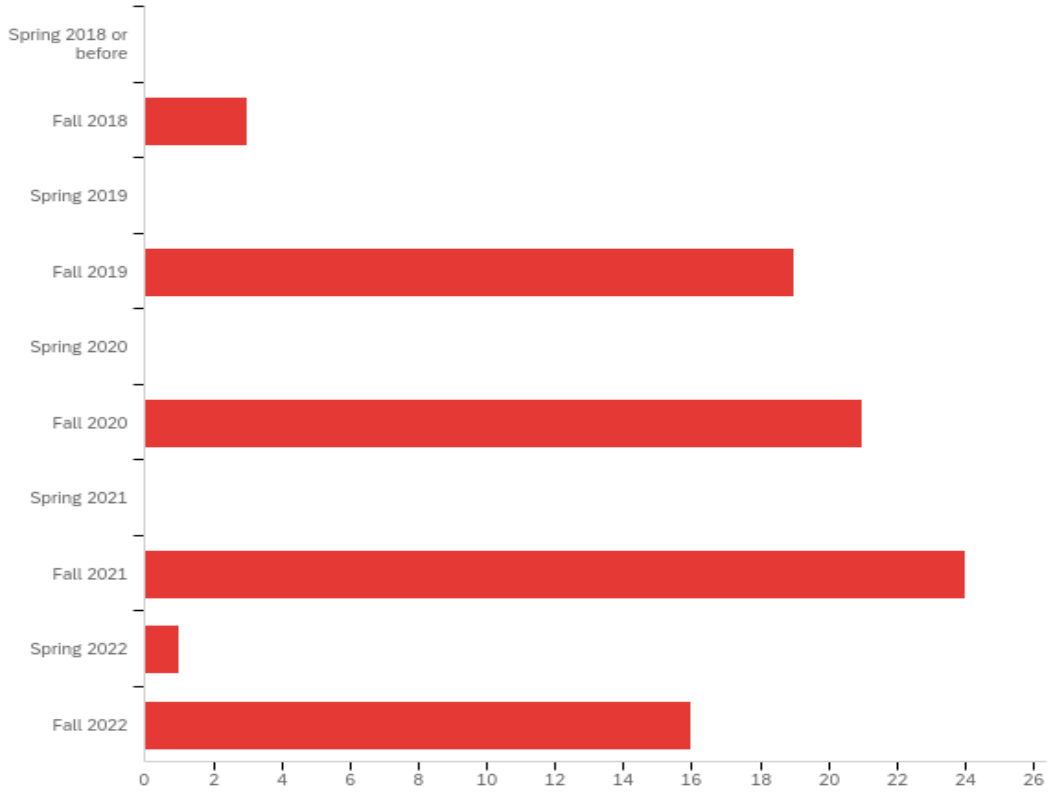
Additional tables and data correlations are available on request.

1 GENERAL BACKGROUND

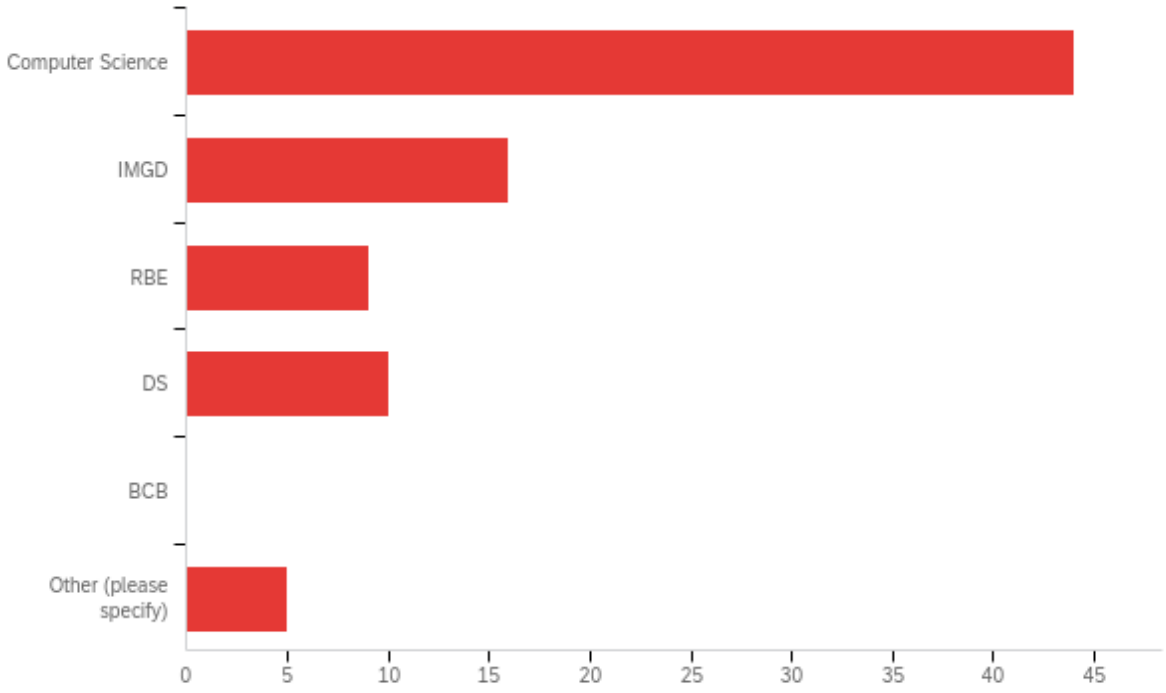
1Q1 What semester did you start taking courses at WPI in?



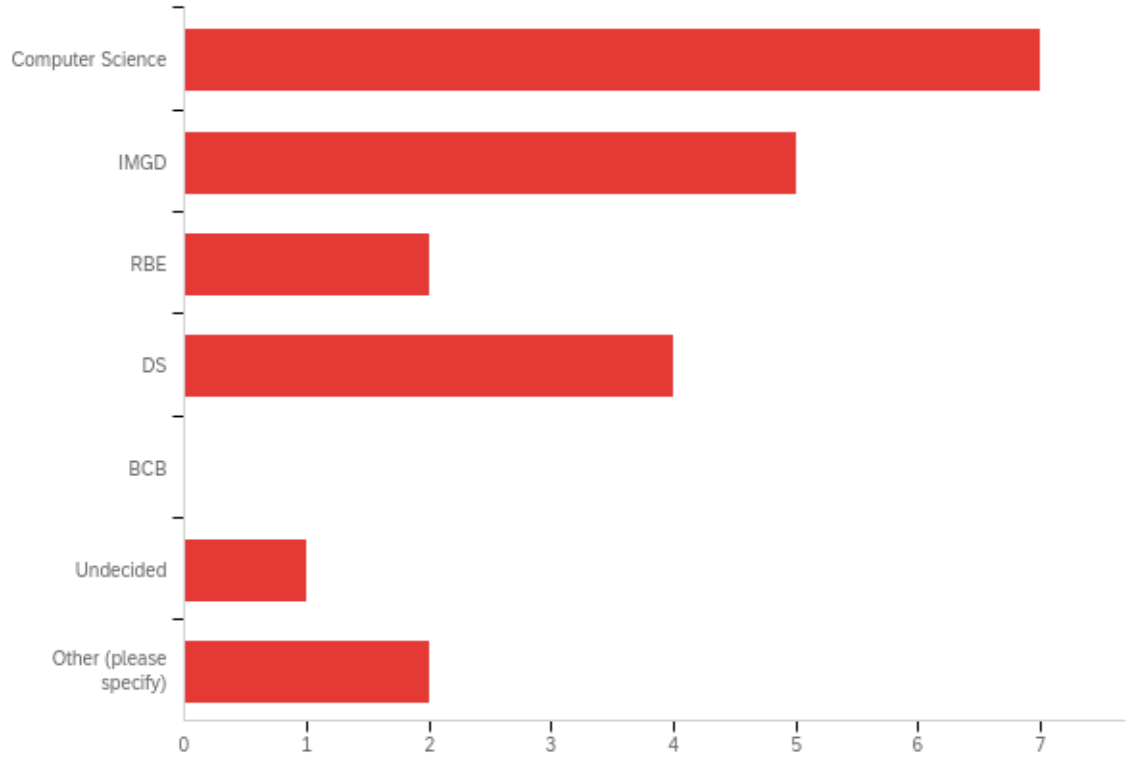
1Q2 When are you planning on graduating with your undergraduate degree?



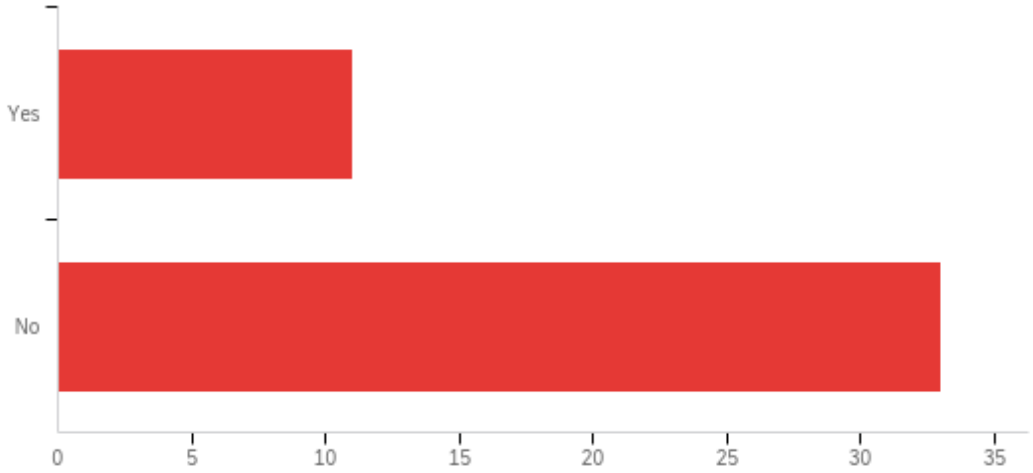
1Q3 What is your major? Check all that apply.



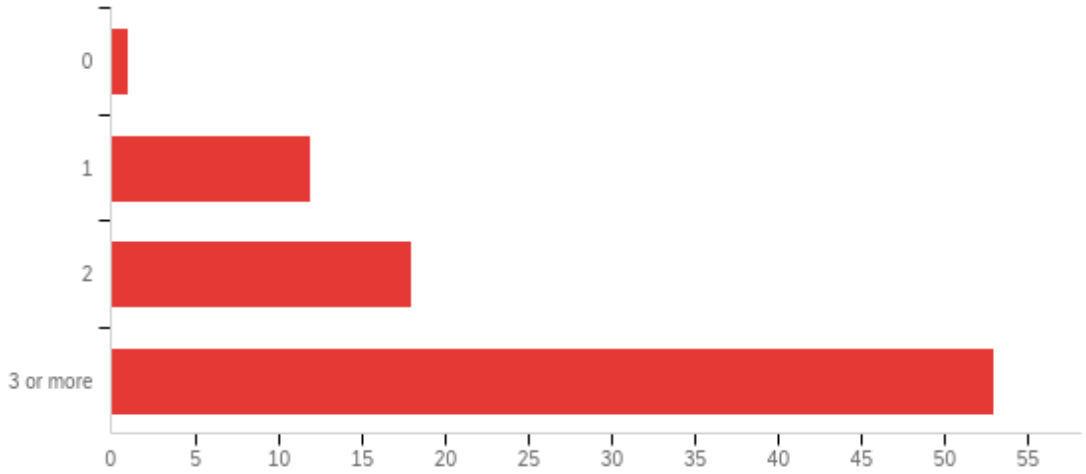
1Q4 What is your intended major? Check all that apply.



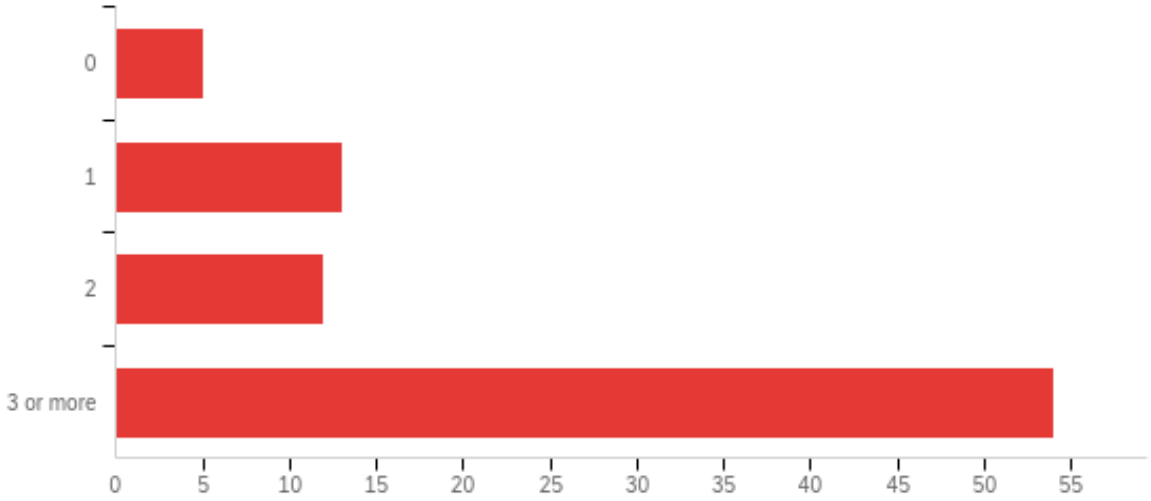
1Q5 Are you currently pursuing the Cyber Security concentration?



1Q6 How many Computer Science courses have you taken so far, if any?

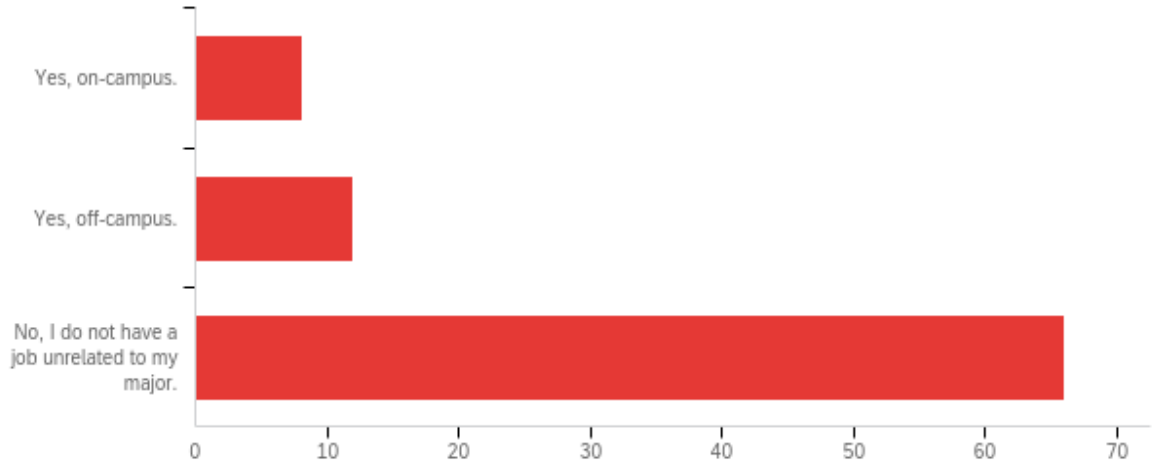


1Q7 How many more Computer Science courses do you plan to take?

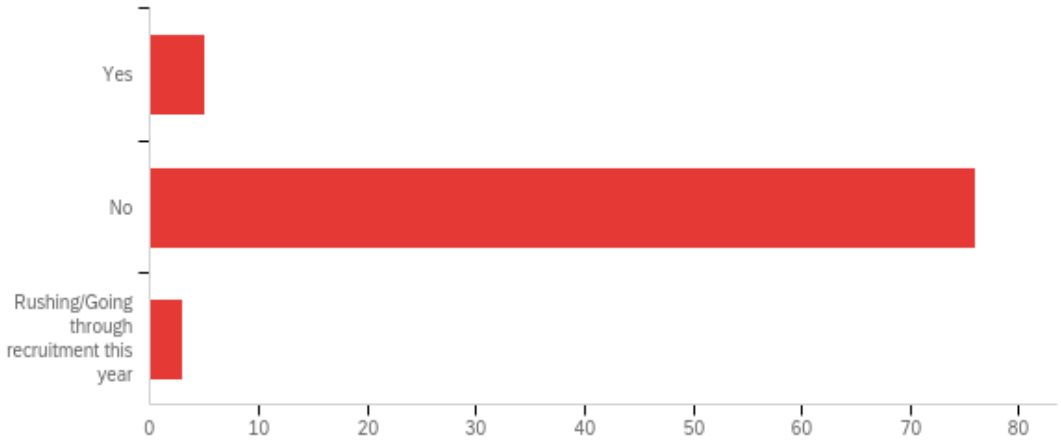


1Q8 Do you have a job unrelated to your major? We will ask about related experiences later on.

Check all that apply.

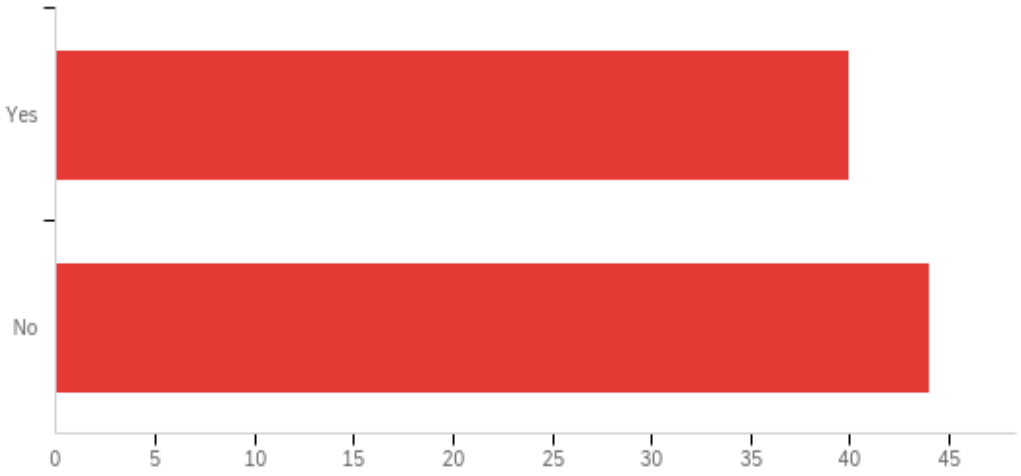


1Q9 Are you involved with Greek Life on campus?

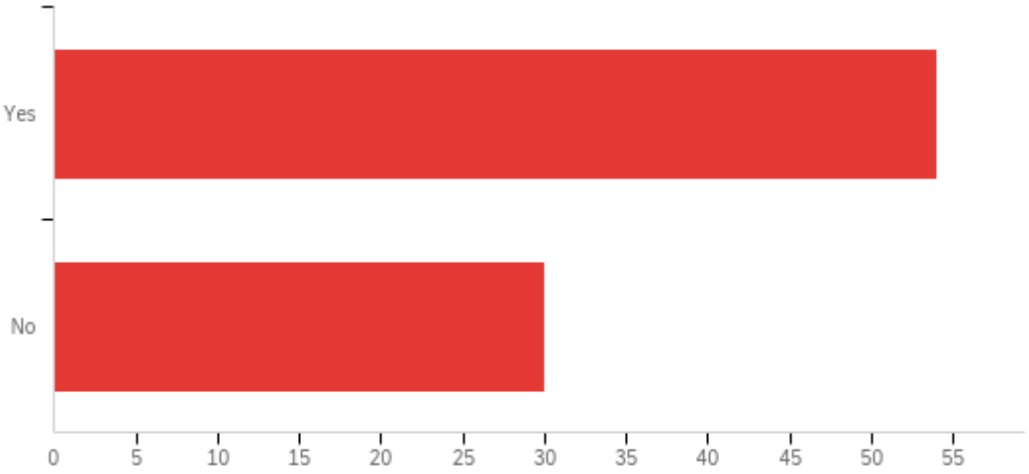


2 COMPUTER SCIENCE BACKGROUND

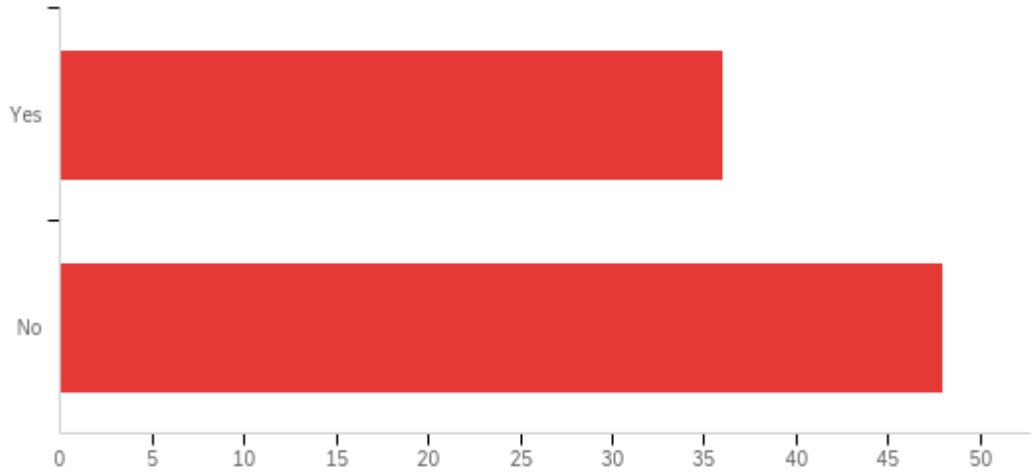
2Q1 Did you take AP Computer Science A in high school?



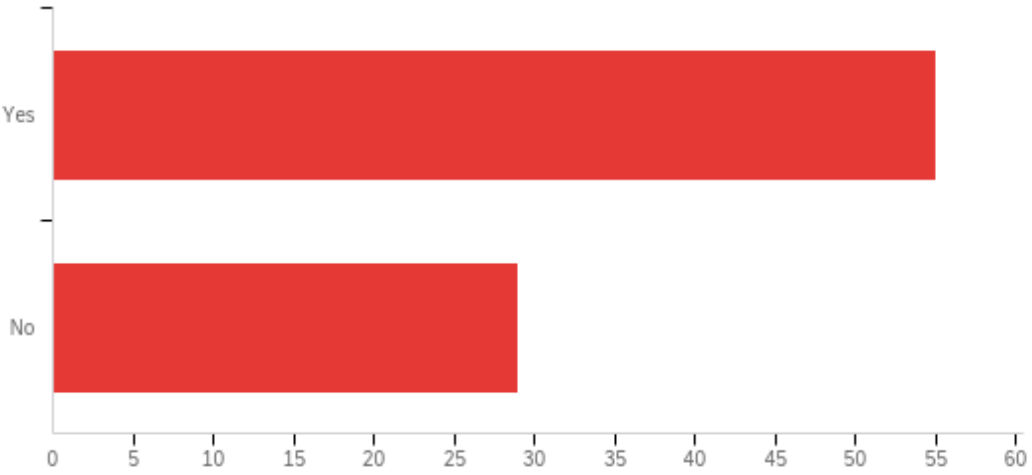
2Q2 Did you take non-AP Computer Science courses in high school?



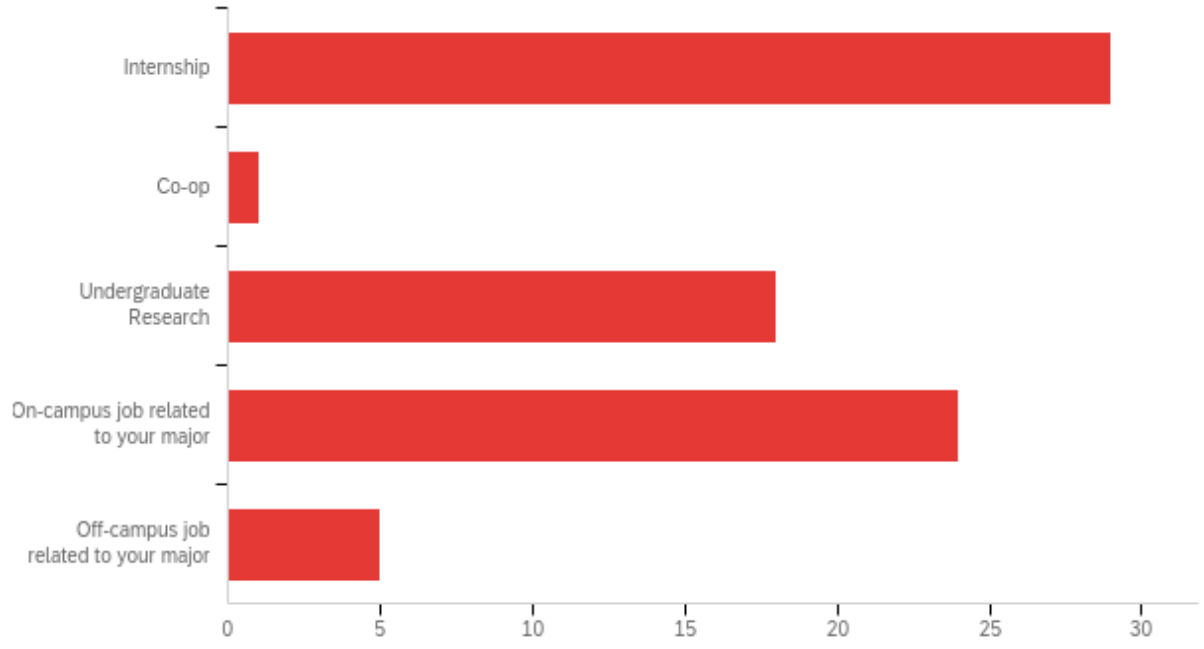
2Q3 Did you take online/extracurricular courses for Computer Science not in your high school?



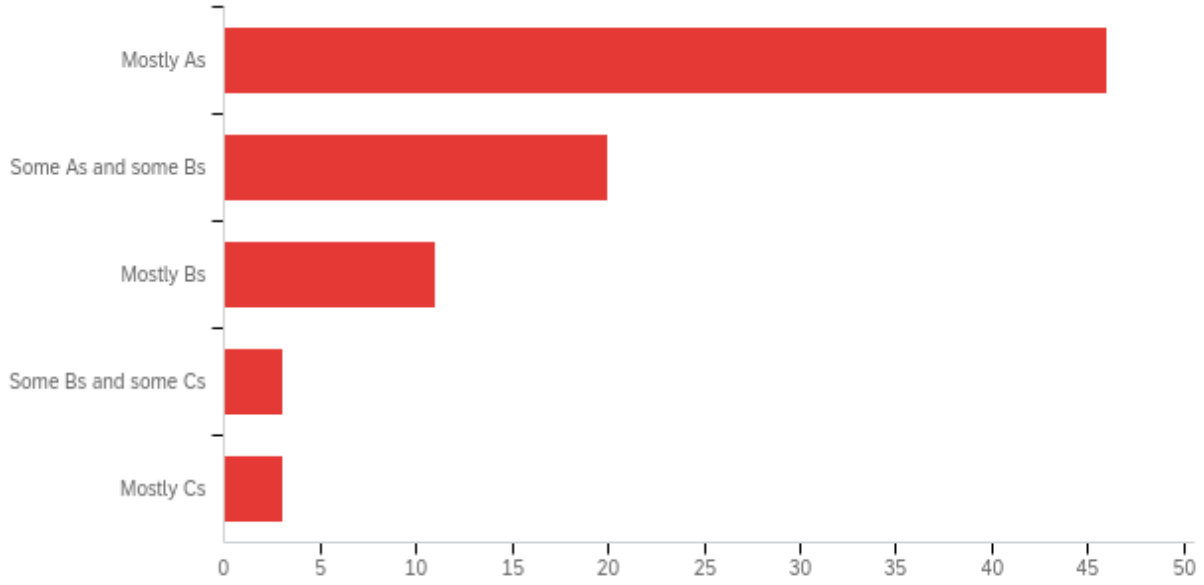
2Q4 Have you worked on extracurricular CS projects (not related to coursework)?



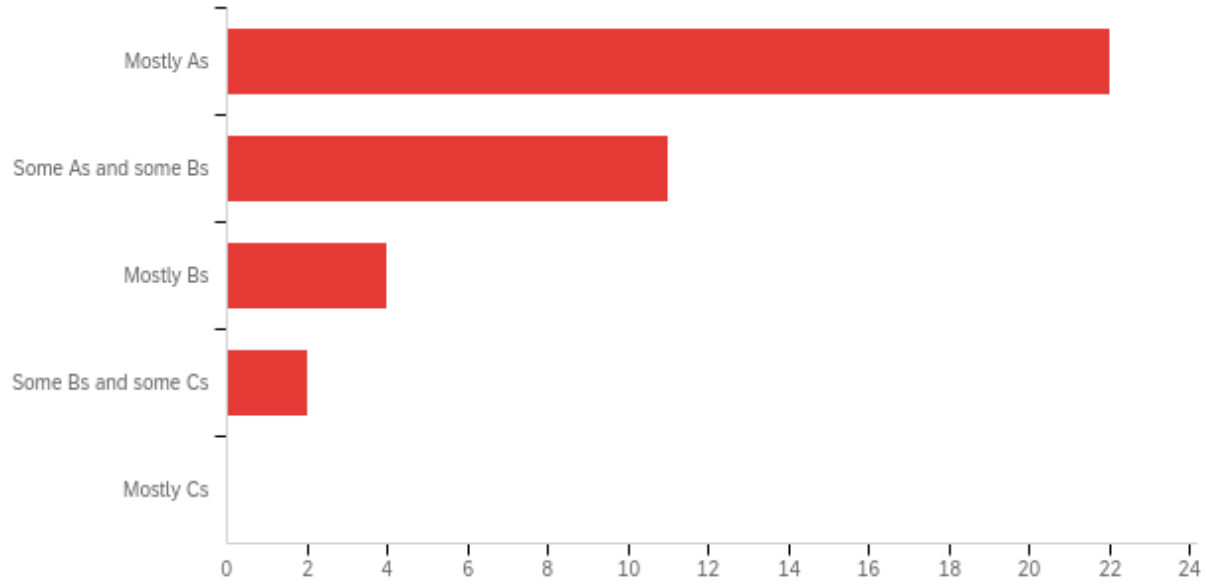
2Q5 Which of the following opportunities did you engage with after becoming a student at WPI? Check all that apply.



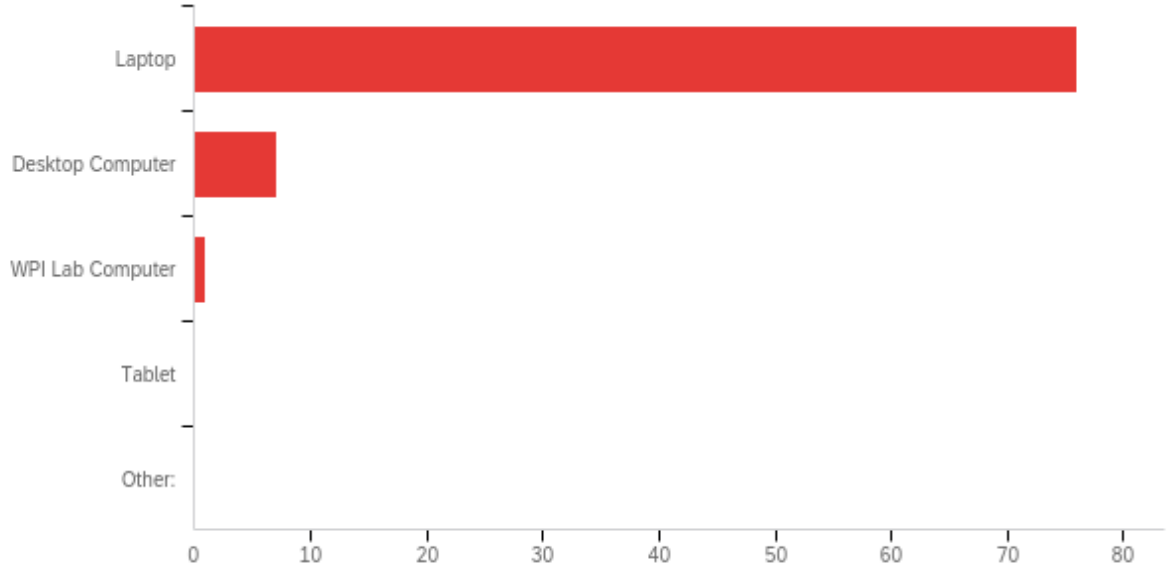
2Q6 Overall, what selection most closely resembles your grades in CS courses?



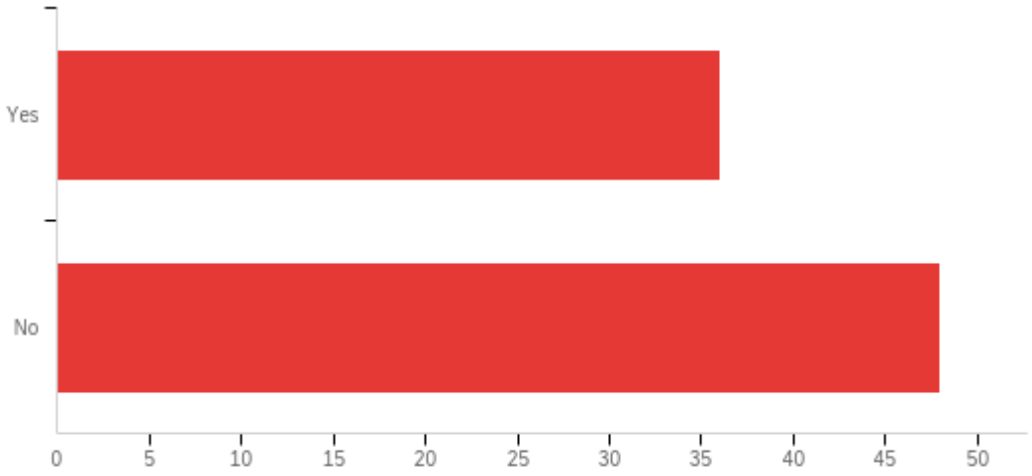
2Q7 Overall, what selection most closely resembles your grades in major-related (not CS) courses?



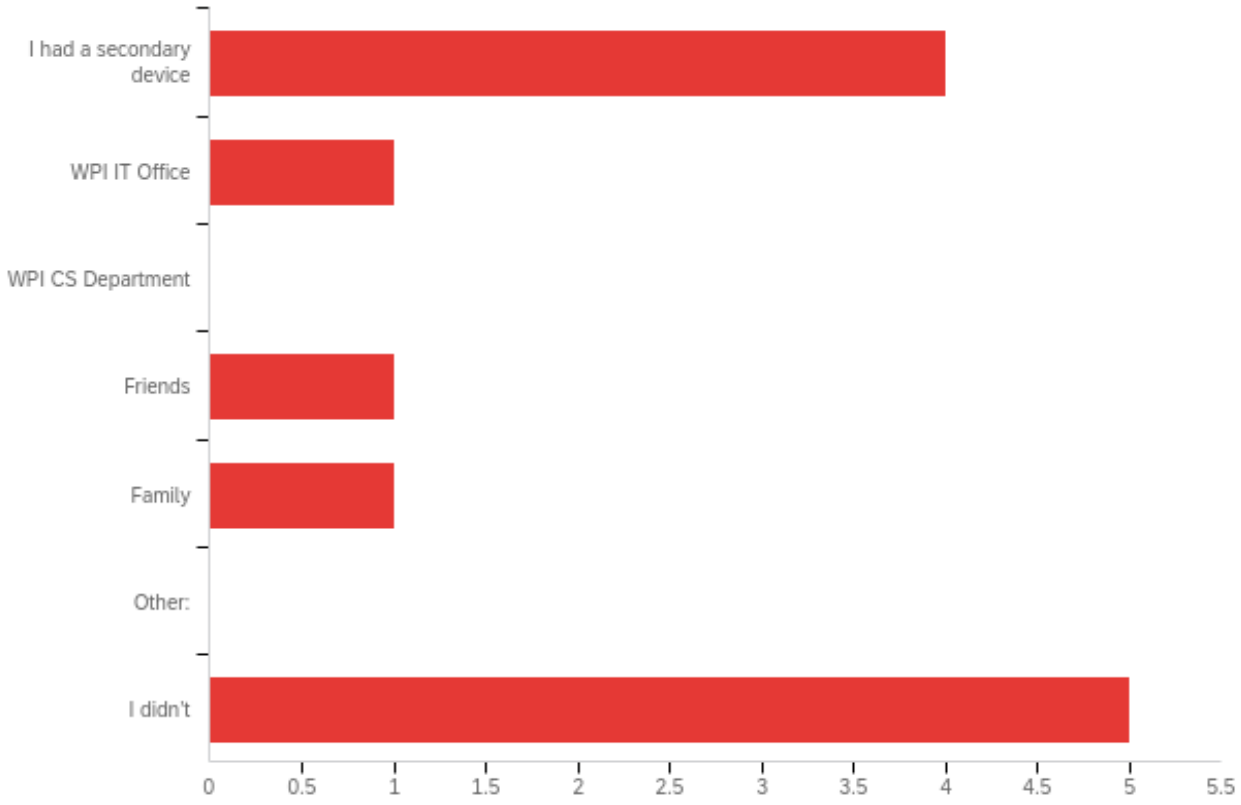
3Q1 What device do you do most of your coursework on?



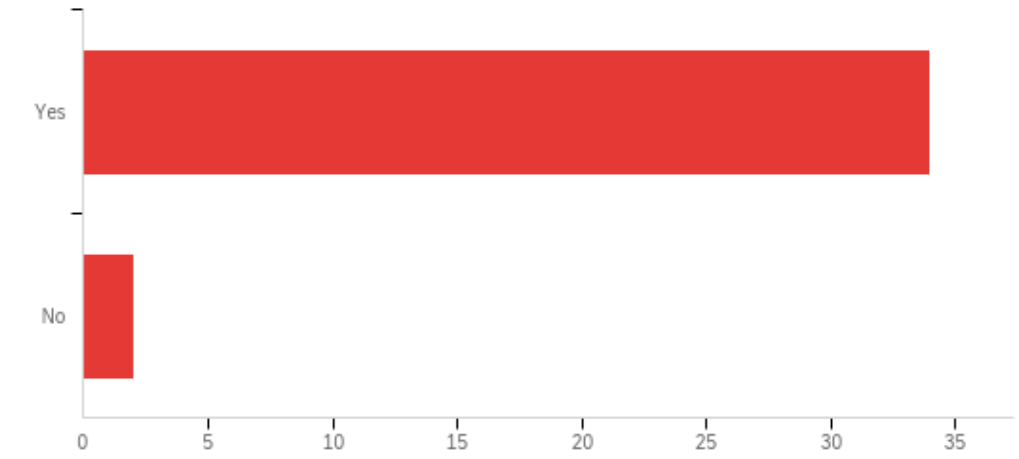
3Q2 Was there ever a time when your device encountered serious issues working (ex. blue-screening, won't turn on, cracked screen)?



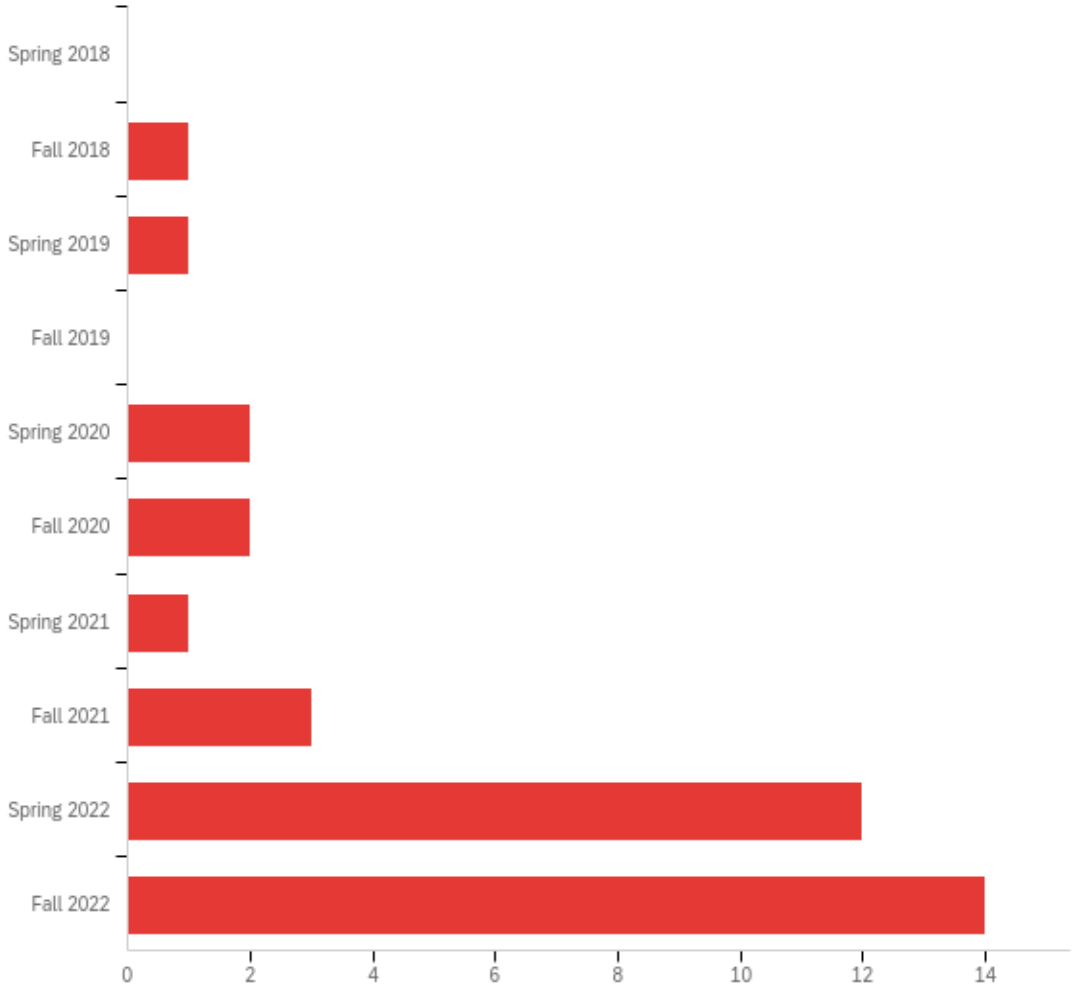
3Q3 Where did you go for an alternate device? Check all that apply.



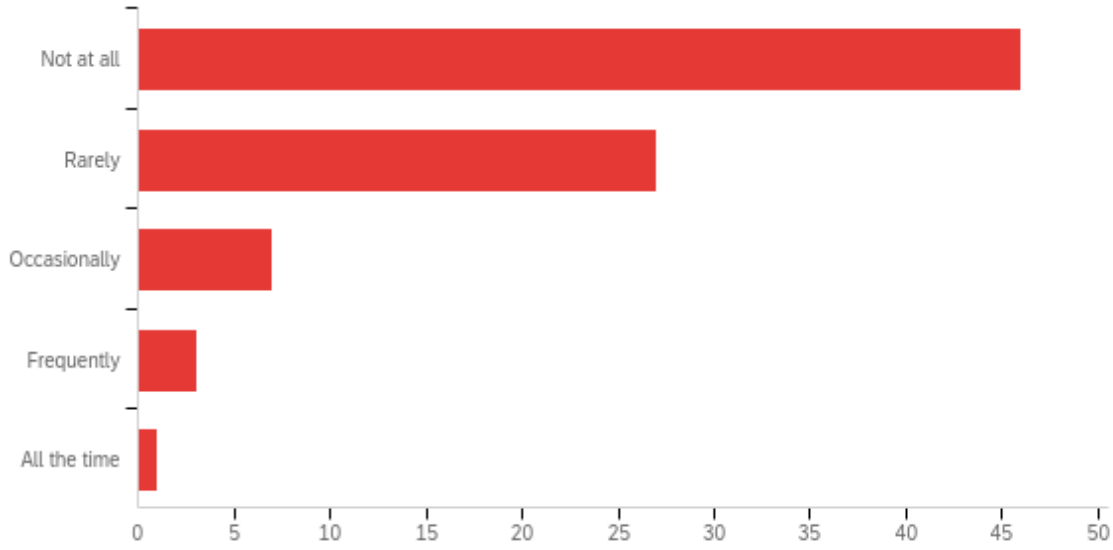
3Q4 Were you able to complete your coursework despite the technological issues?



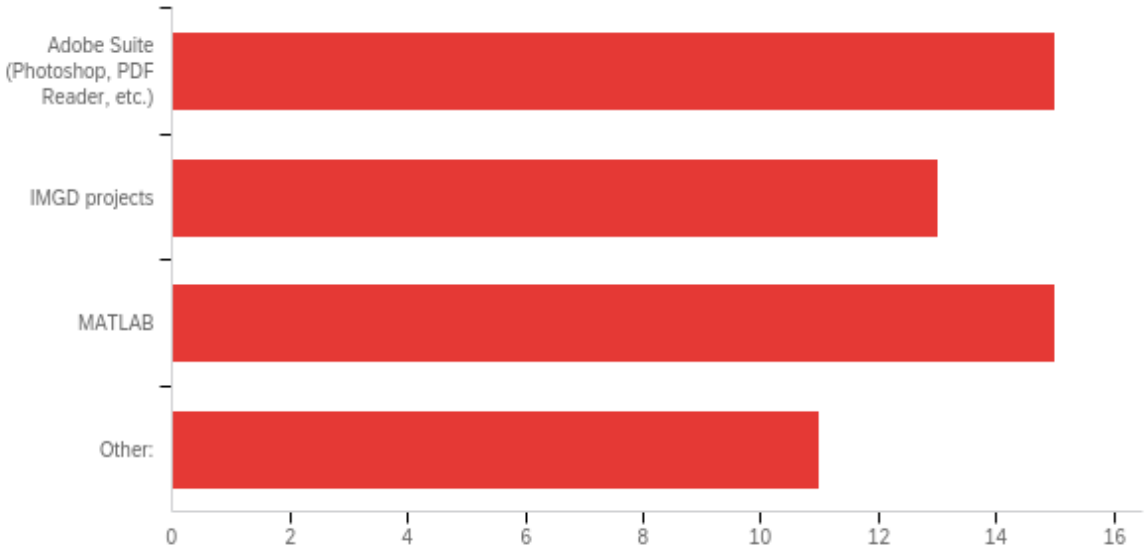
3Q5 When was the last time you had these technological issues?



3Q6 How often do you use WPI Lab computers for coursework?

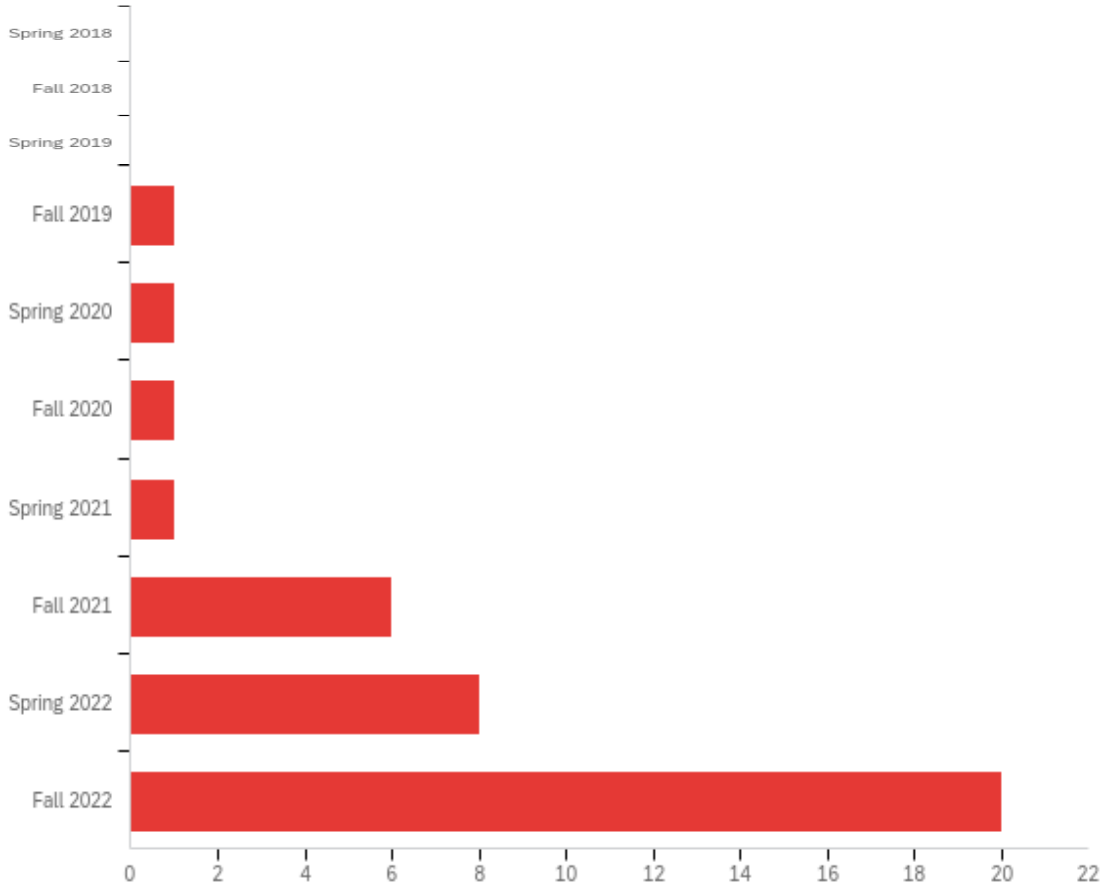


3Q7 What purpose do you use WPI Lab computers for? Check all that apply.

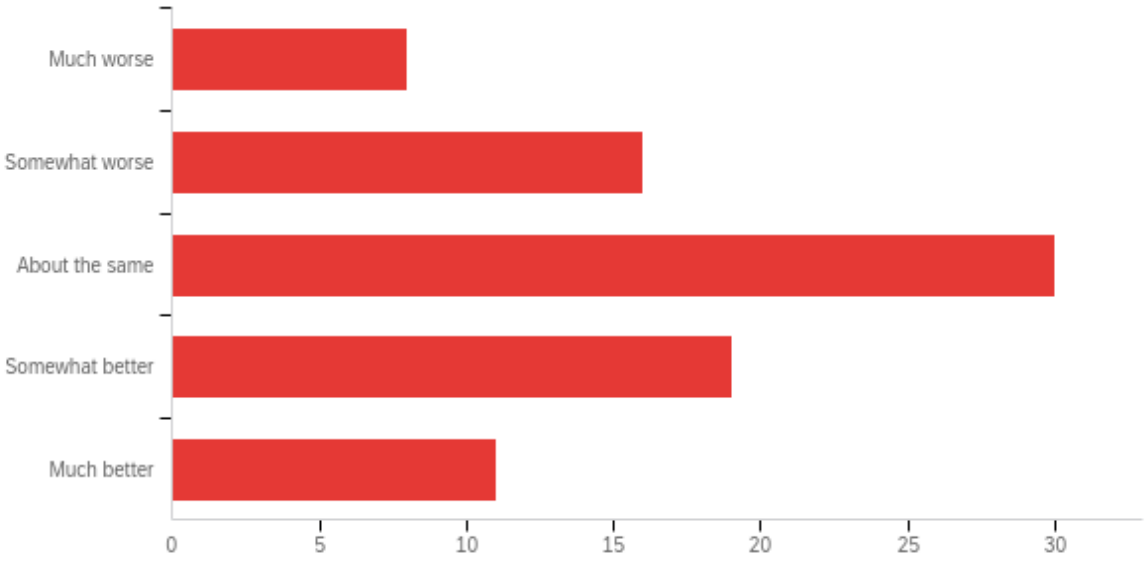


Other: Dead battery, documentation lookup, RBE homework, Vivado Design Suite, extra screen, other specialized software (ECE), CAD, Max and Ableton, secure network (red cables)

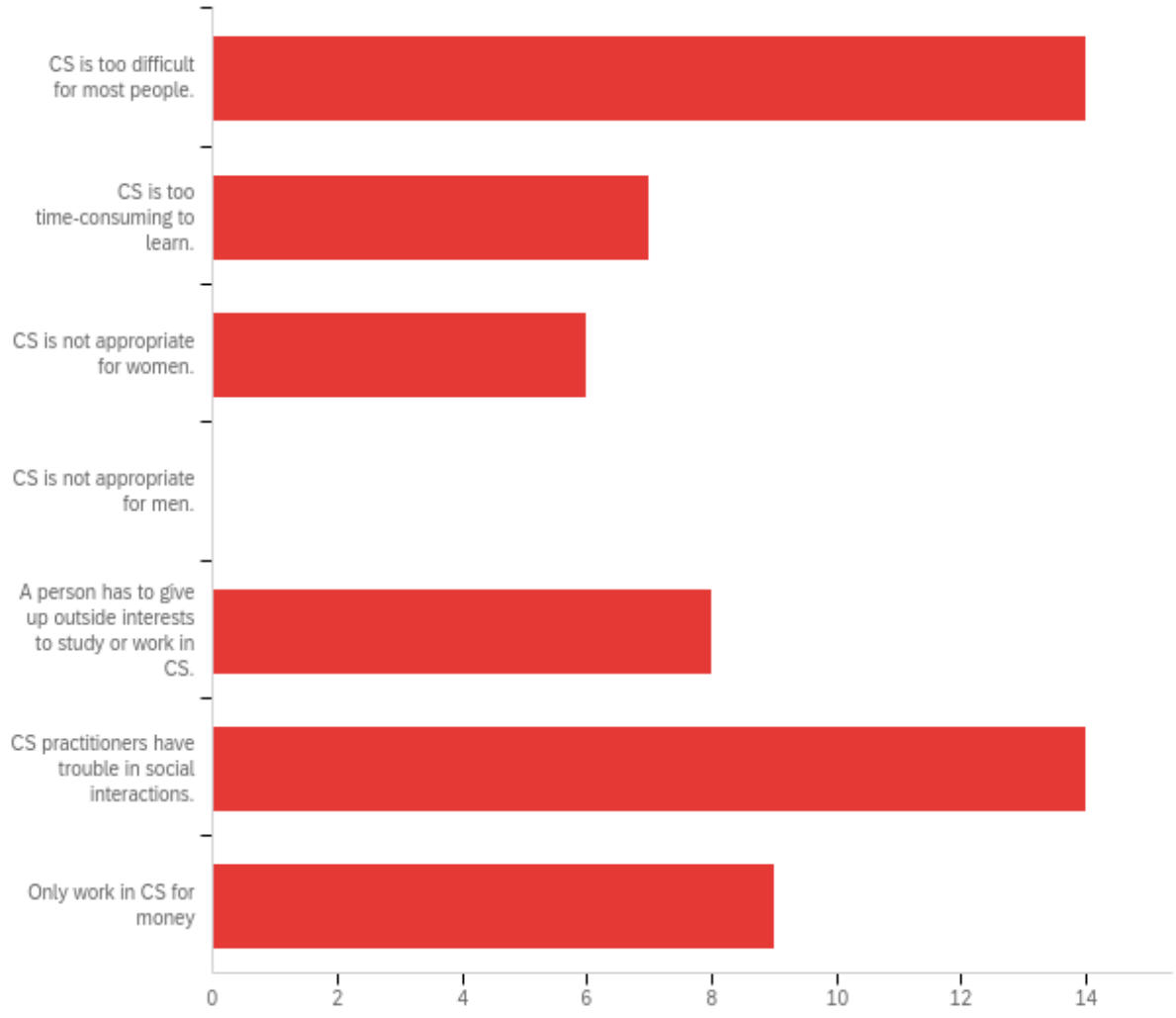
3Q8 When was the last time you used the WPI Lab computers?



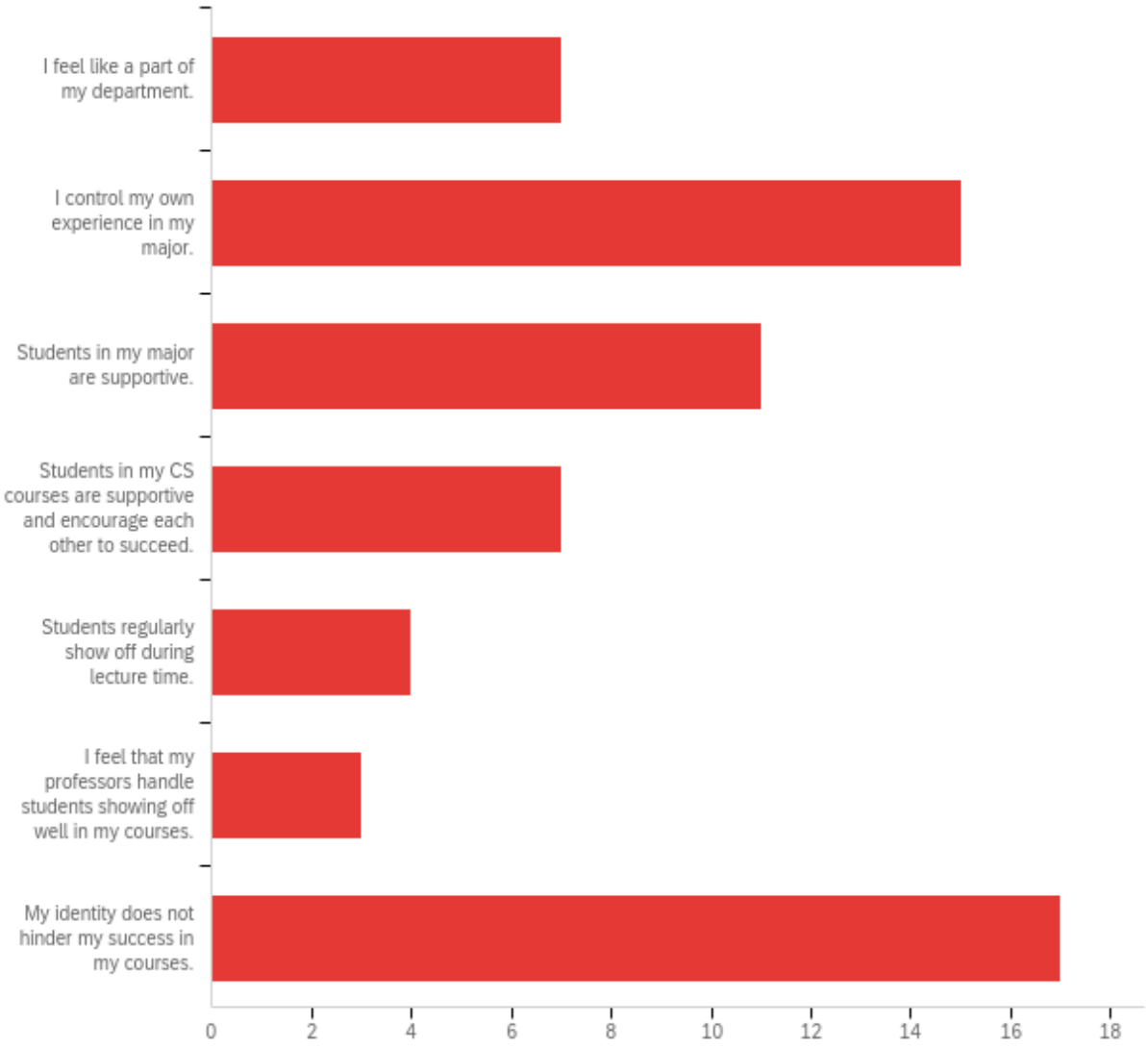
4Q1 How would you rate your Computer Science abilities compared to that of your peers?



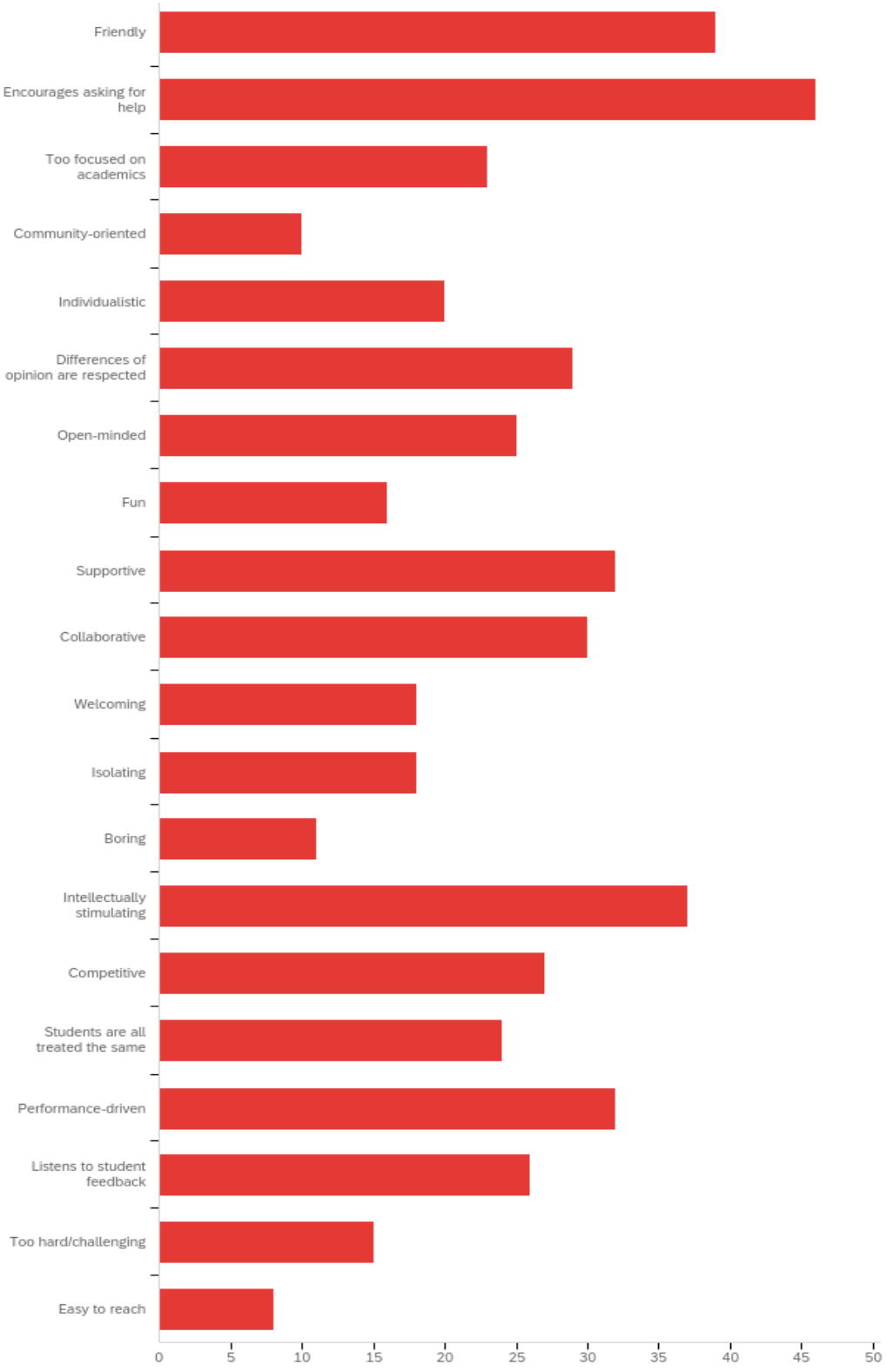
4Q2 What beliefs listed below, if any, do you think people generally have about Computer Science? Check all that apply.



4Q3 What statements about your own personal feelings being involved with your department are true? Check all that apply.



4Q4 Which of the following words describe the general atmosphere of the CS Department, in and out of classes? Check all that apply.



4Q5 What, if any, are CS courses that have a reputation for negative experiences?

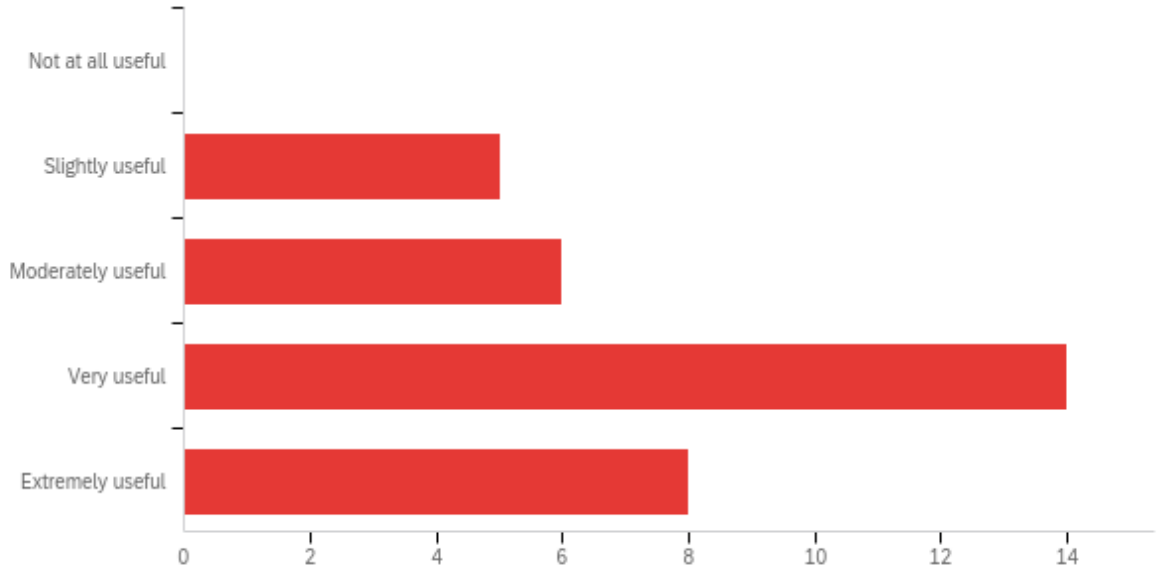
Course Number	Number of Submissions
CS1101 / CS1102	3
CS2301 / CS2303	7
CS3013	4
CS3516	2
CS3733	9

Other: CS2102, assorted IMGD courses

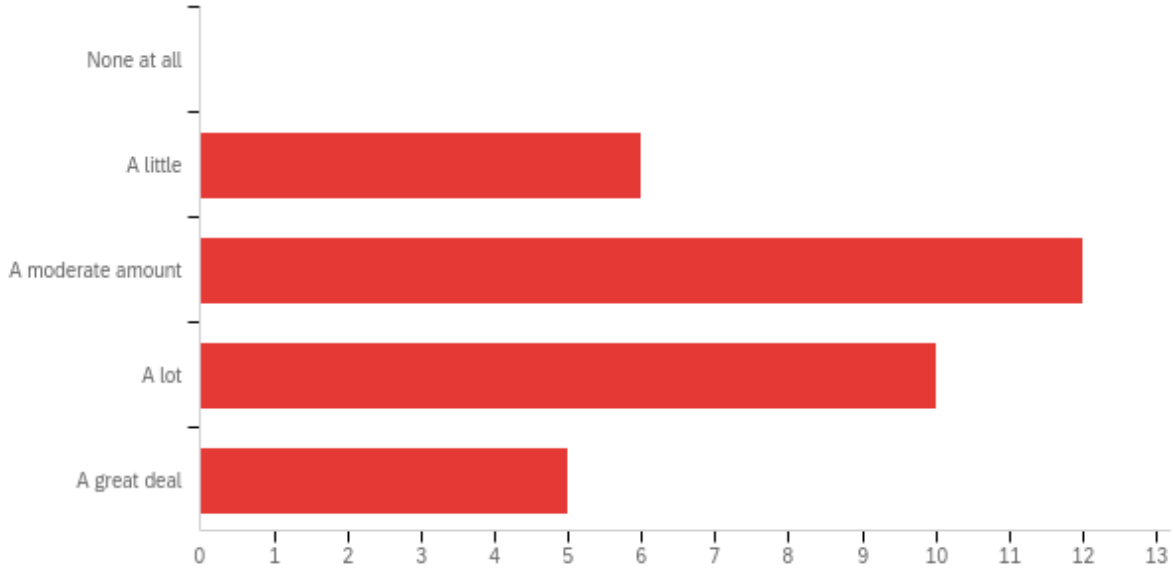
4Q6 What, if any, are CS courses that have a reputation for positive experiences?

Course Number	Number of Submissions
CS2011	1
CS2223	3
CS3733	1

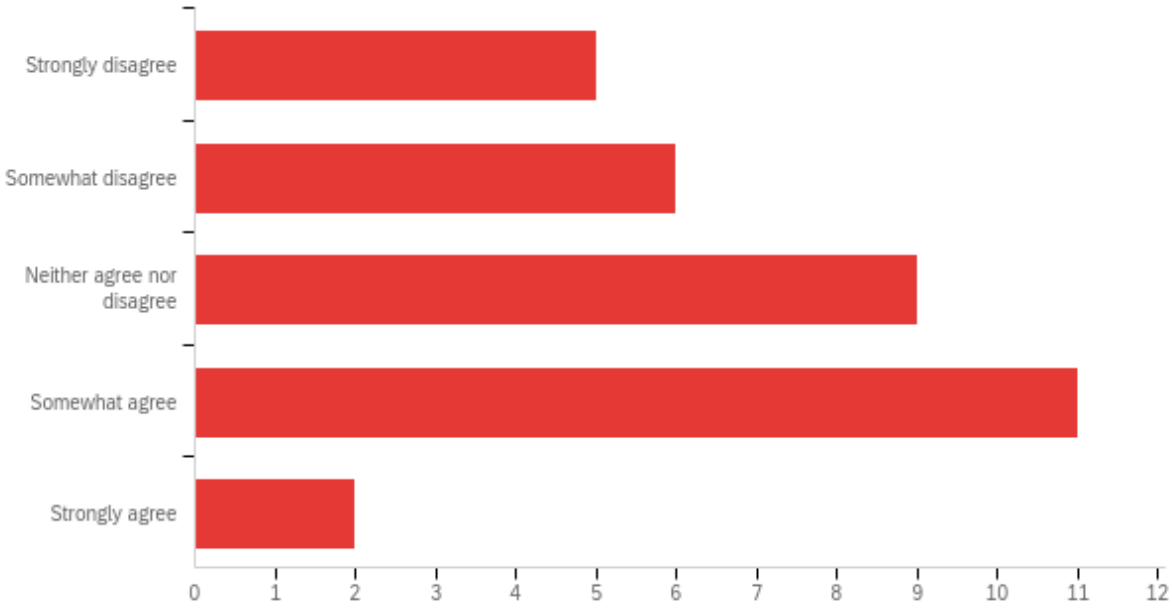
5Q1 In your opinion, how much does the content of CS courses help with your major?



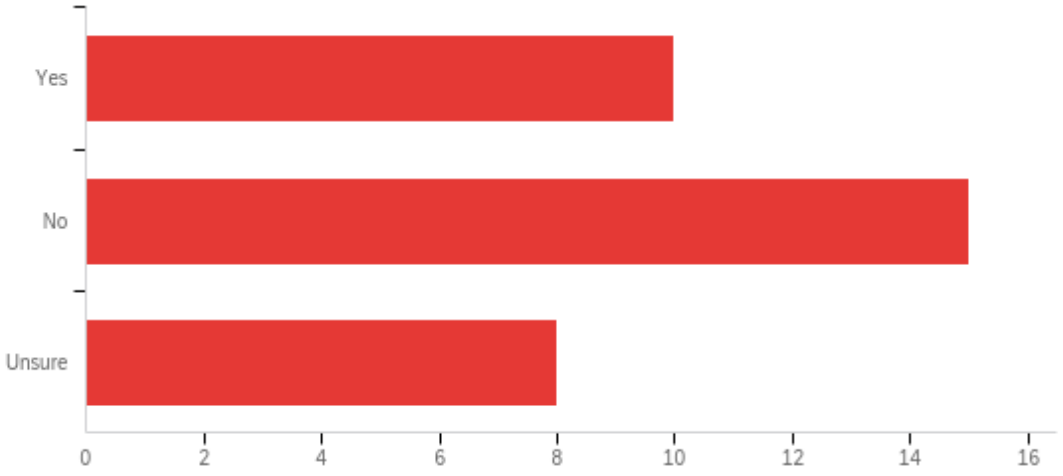
5Q2 How much time do you spend on CS coursework compared to major-specific courses?



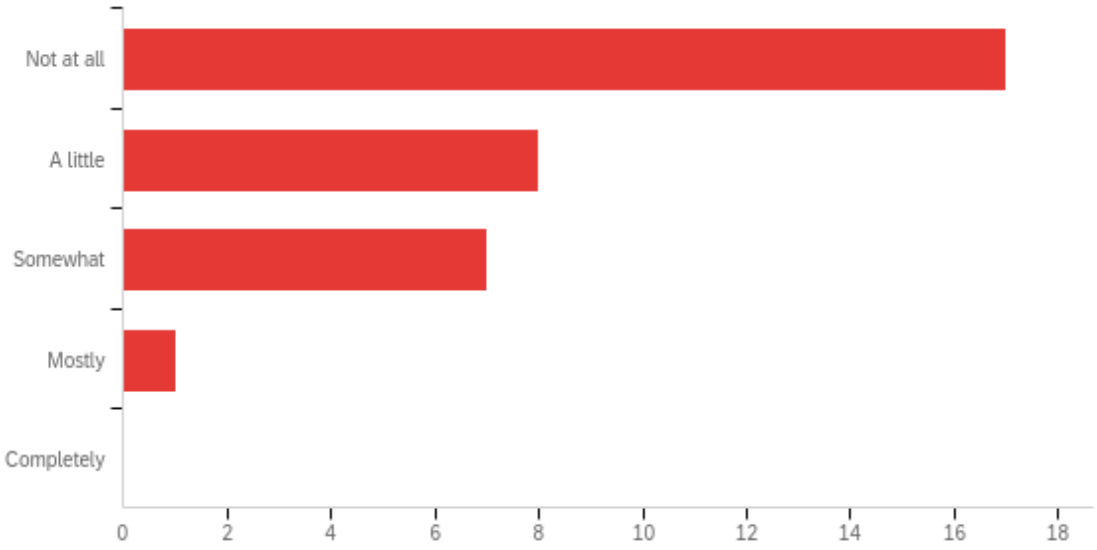
5Q3 How prepared did/do you feel for your CS coursework?



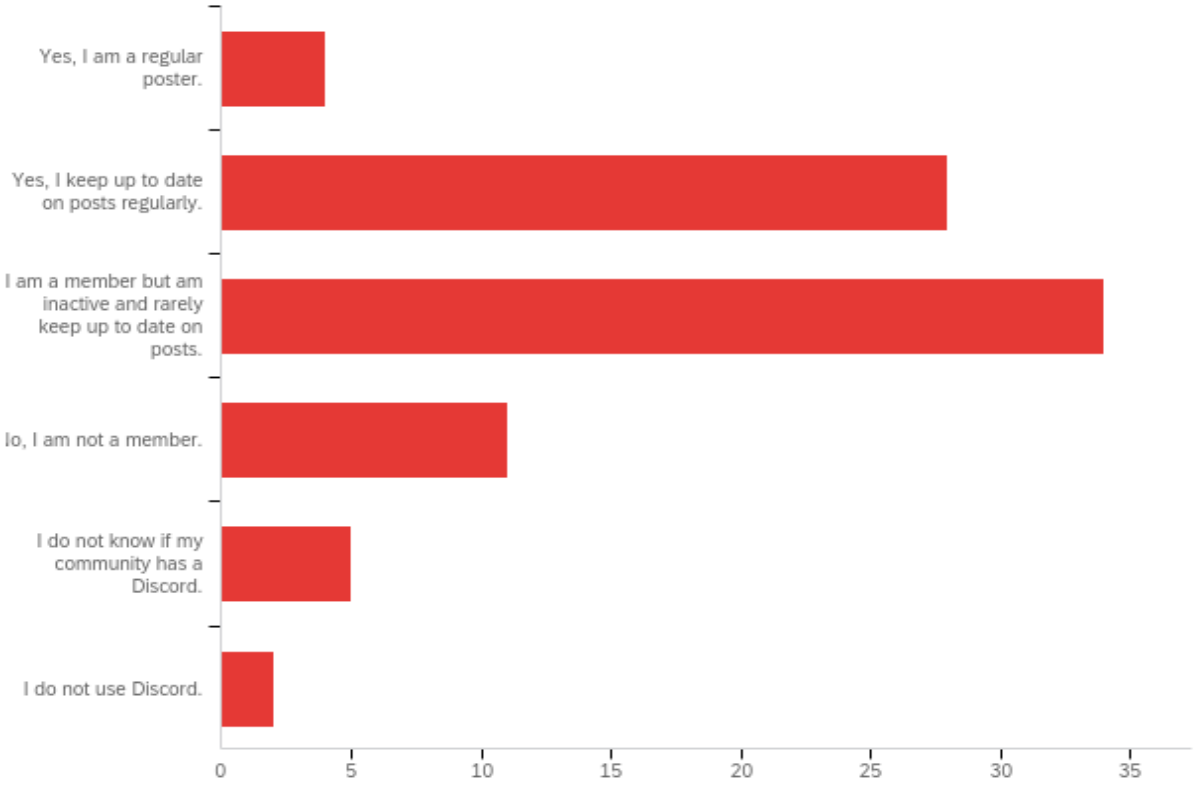
5Q4 Are you planning on taking Software Engineering to complete requirements for your major?



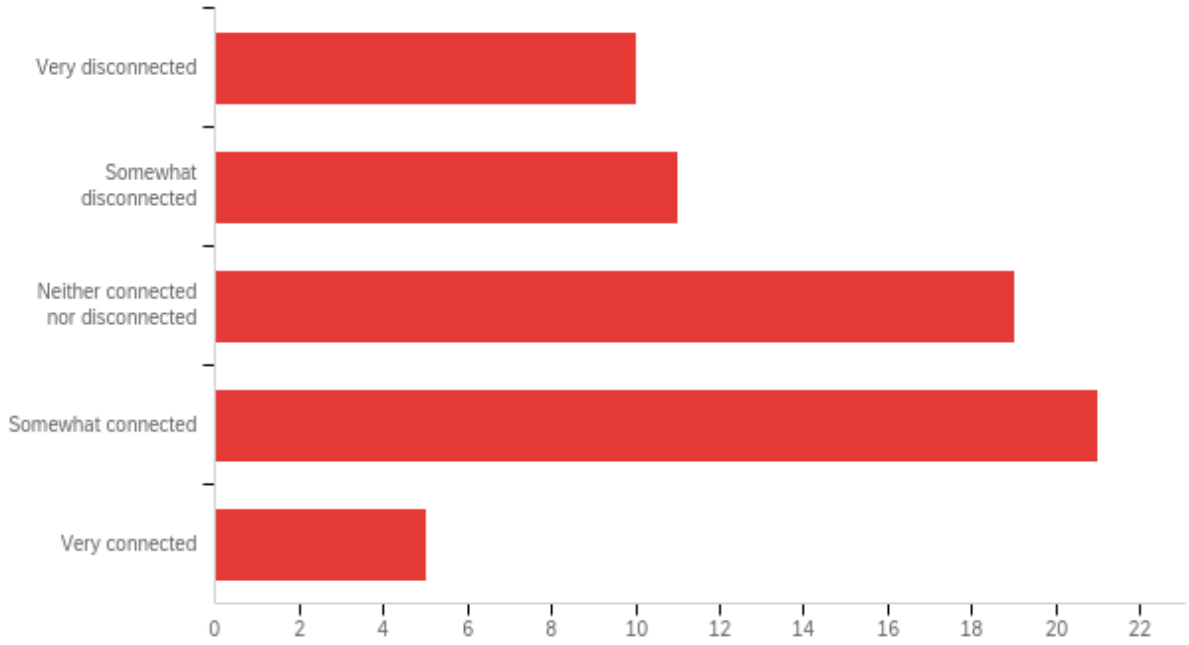
5Q5 How prepared did/do you feel about taking Software Engineering?



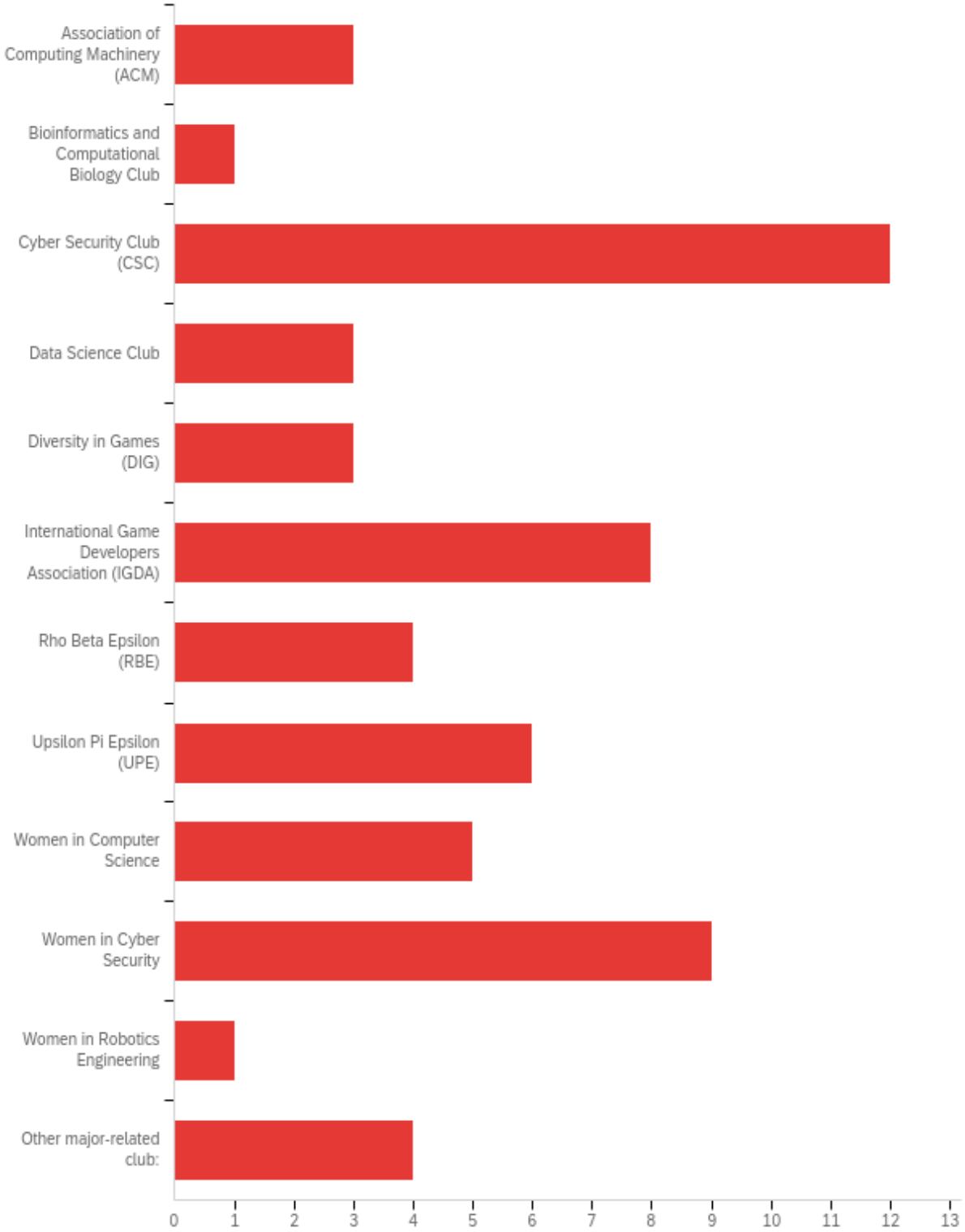
6Q1 Are you involved in the Discord community for your major?



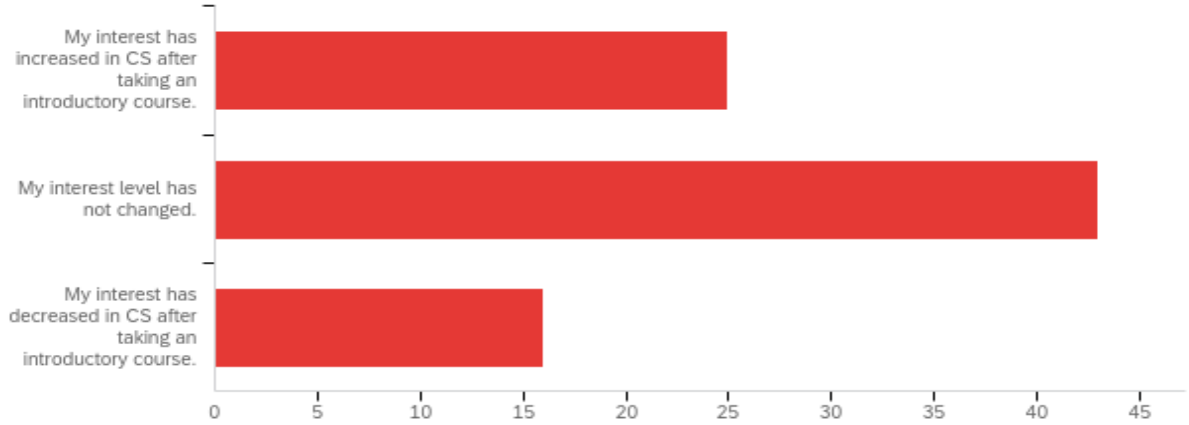
6Q2 How connected do you feel with your major's community through Discord?



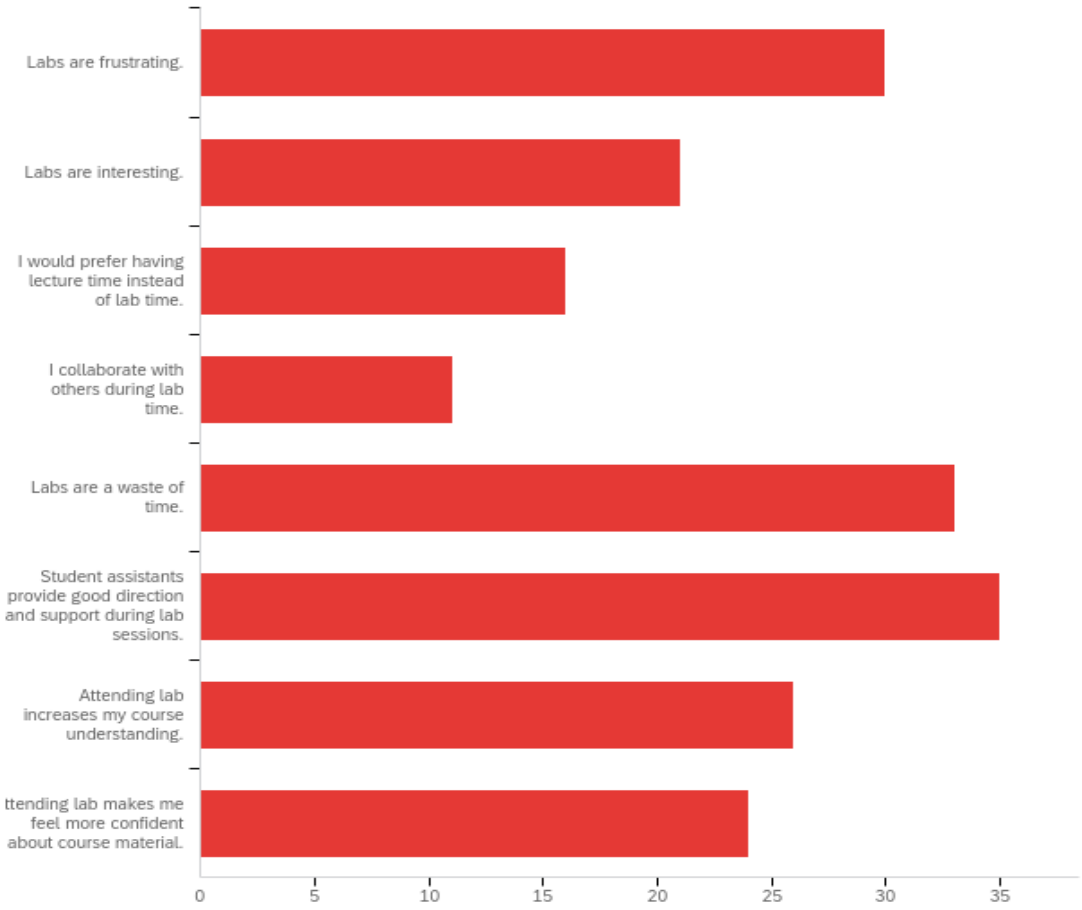
7Q1 Do you consider yourself an active member of any of these organisations? Check all that apply.



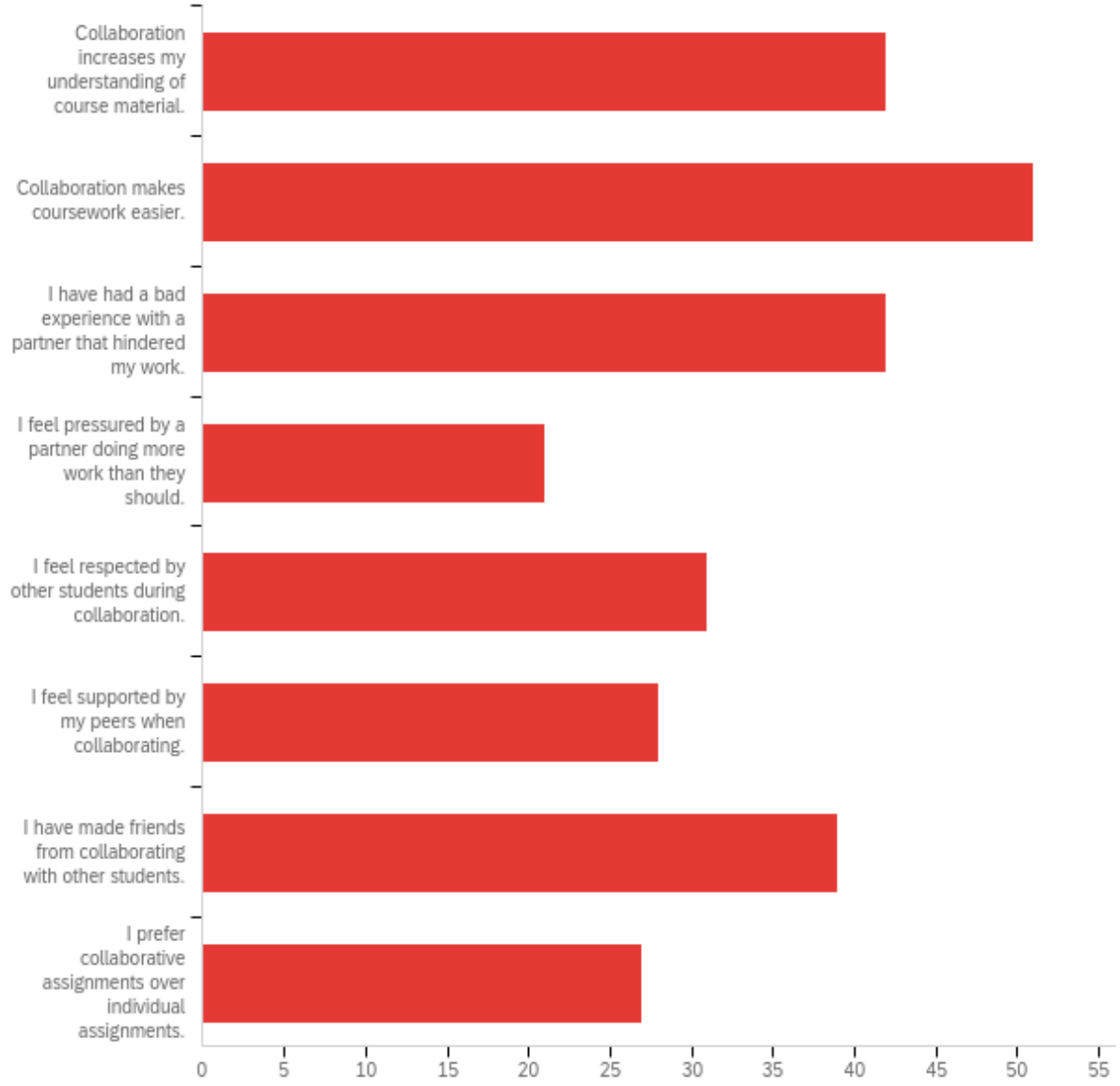
8Q1 Do/did the introductory CS courses make you more interested in CS? (1101, 1102, 2102, 2103)



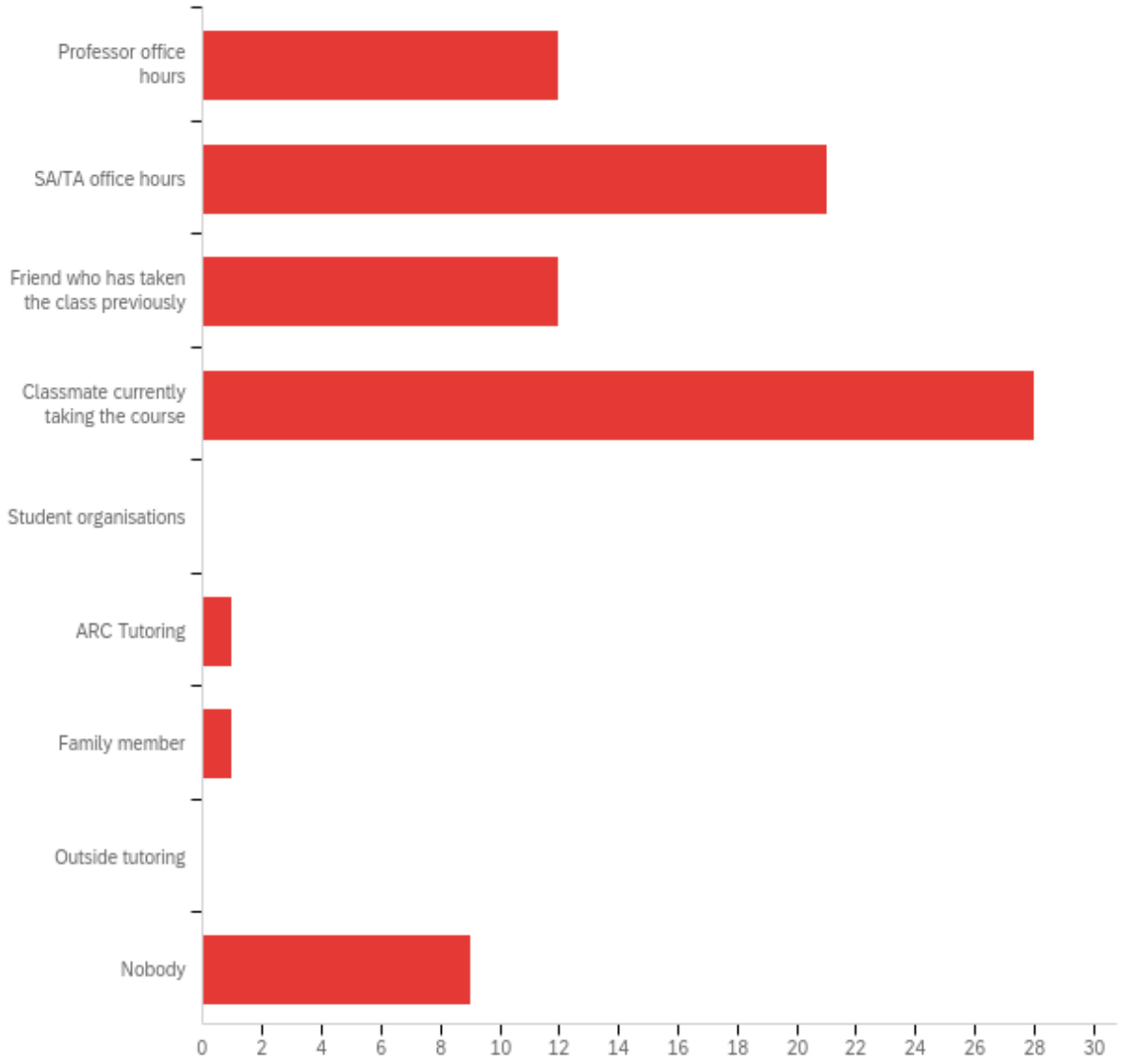
8Q2 Which of the following statements holds true about introductory CS course labs? Check all that apply.



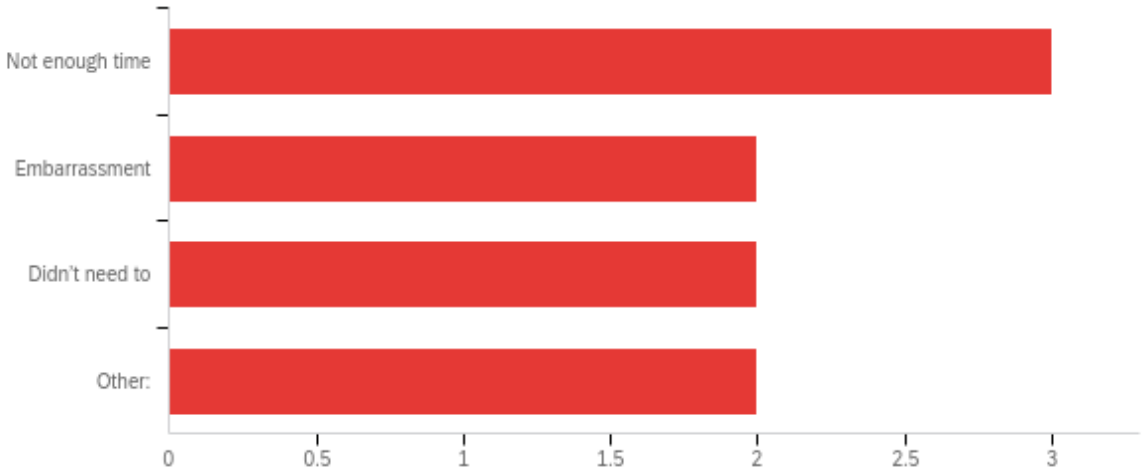
8Q3 How do you feel about collaboration on CS projects and assignments? Check all that apply.



8Q4 Who do you go to when you need assistance with coursework?

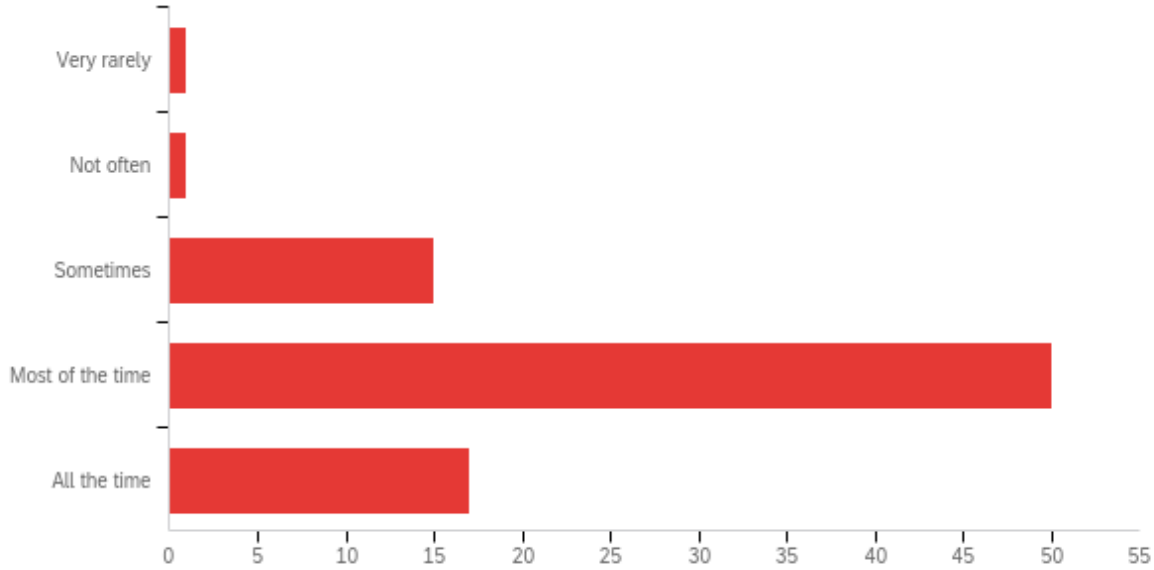


8Q5 What are some reasons, if any, for not seeking help?

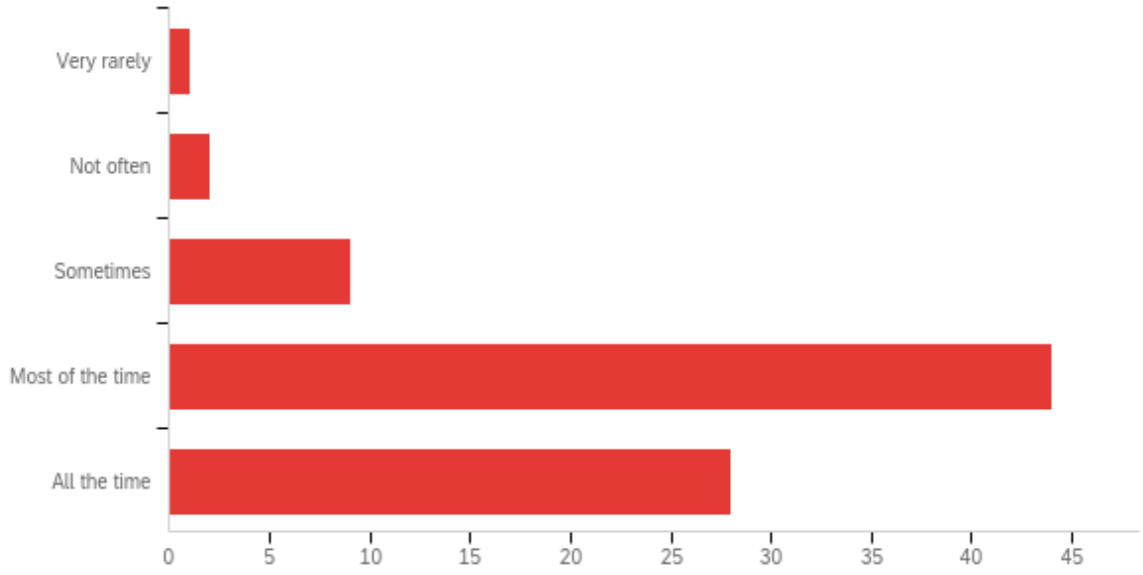


Other: I have no friends at WPI, and I have very little faith in WPI helping me succeed in my courses; I forgor

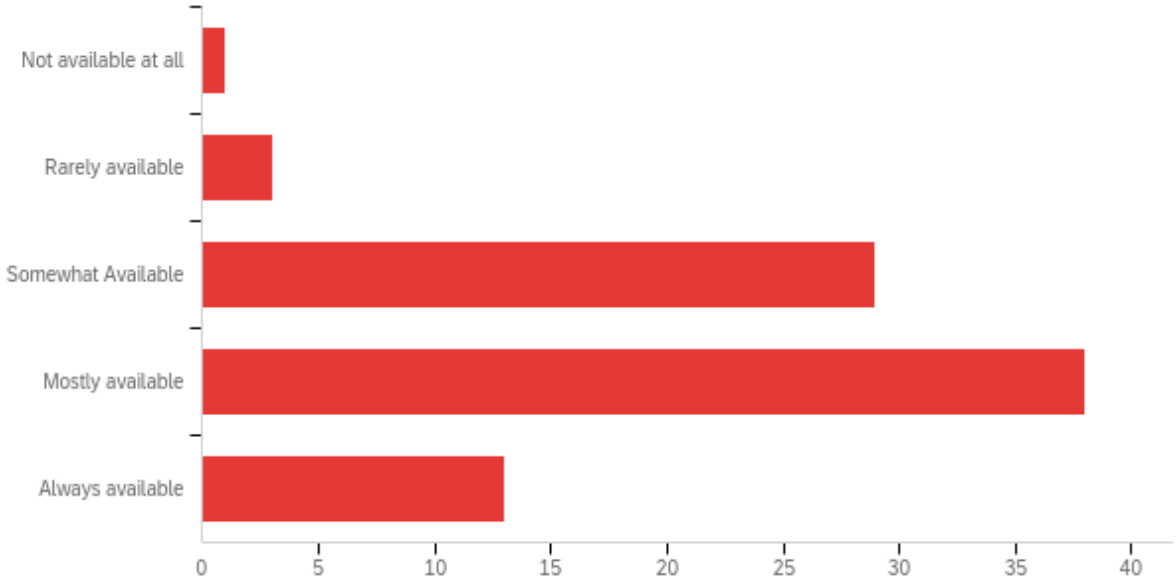
9Q1 How often do you find that professors listen to you?



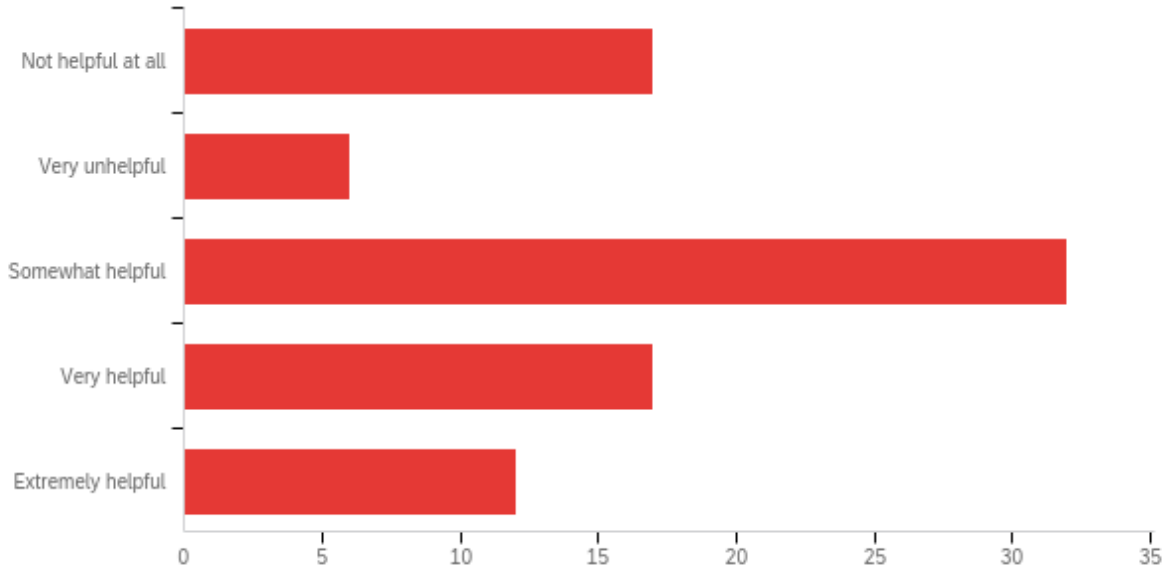
9Q2 How often do you find that professors want to help you?



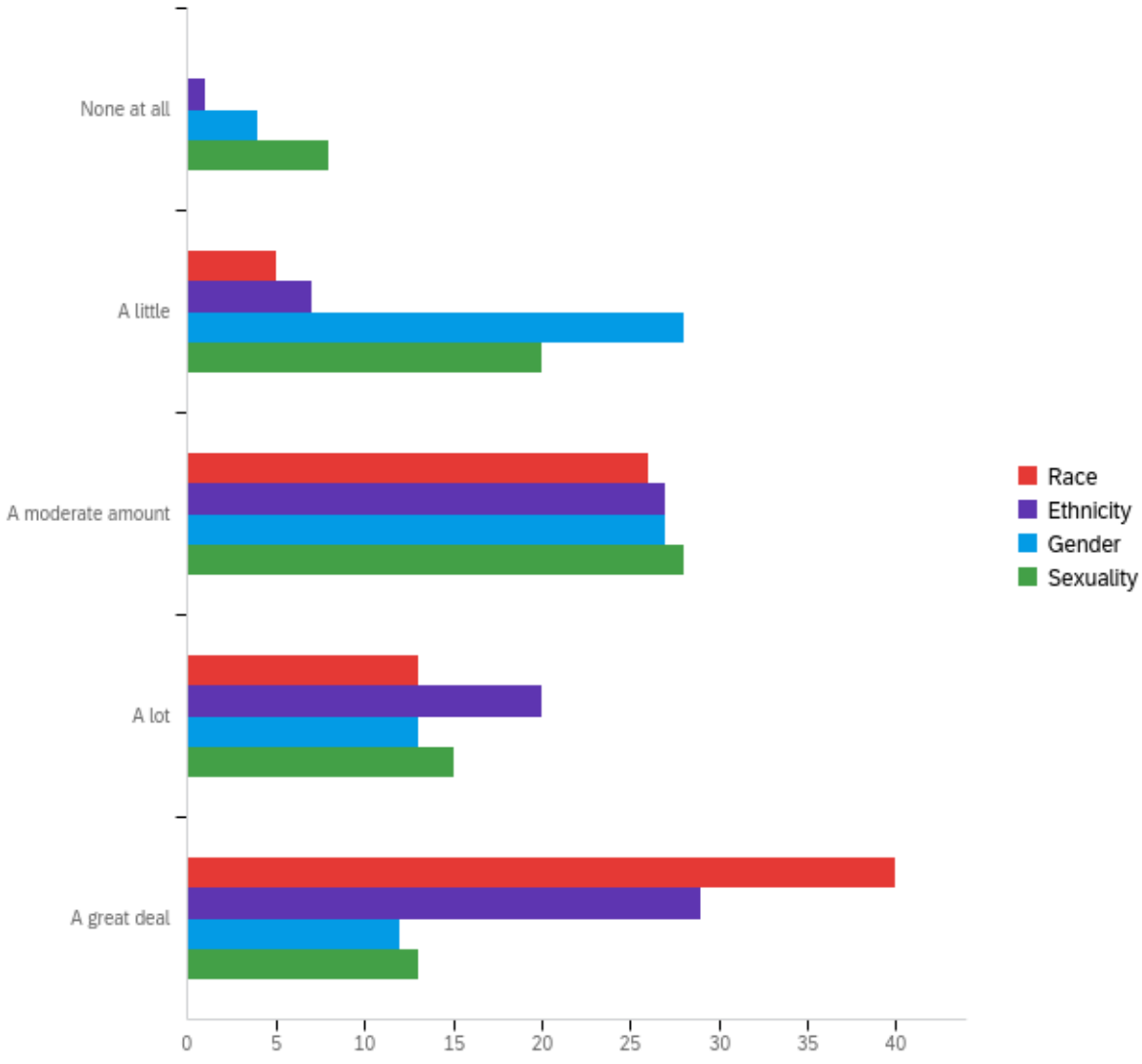
9Q3 How available are professors for office hours?



9Q4 How helpful have you found your faculty advisor?



9Q5 How much do you feel represented by members of the faculty in the CS Department in the following categories: race, ethnicity, gender, and sexuality?


None at all
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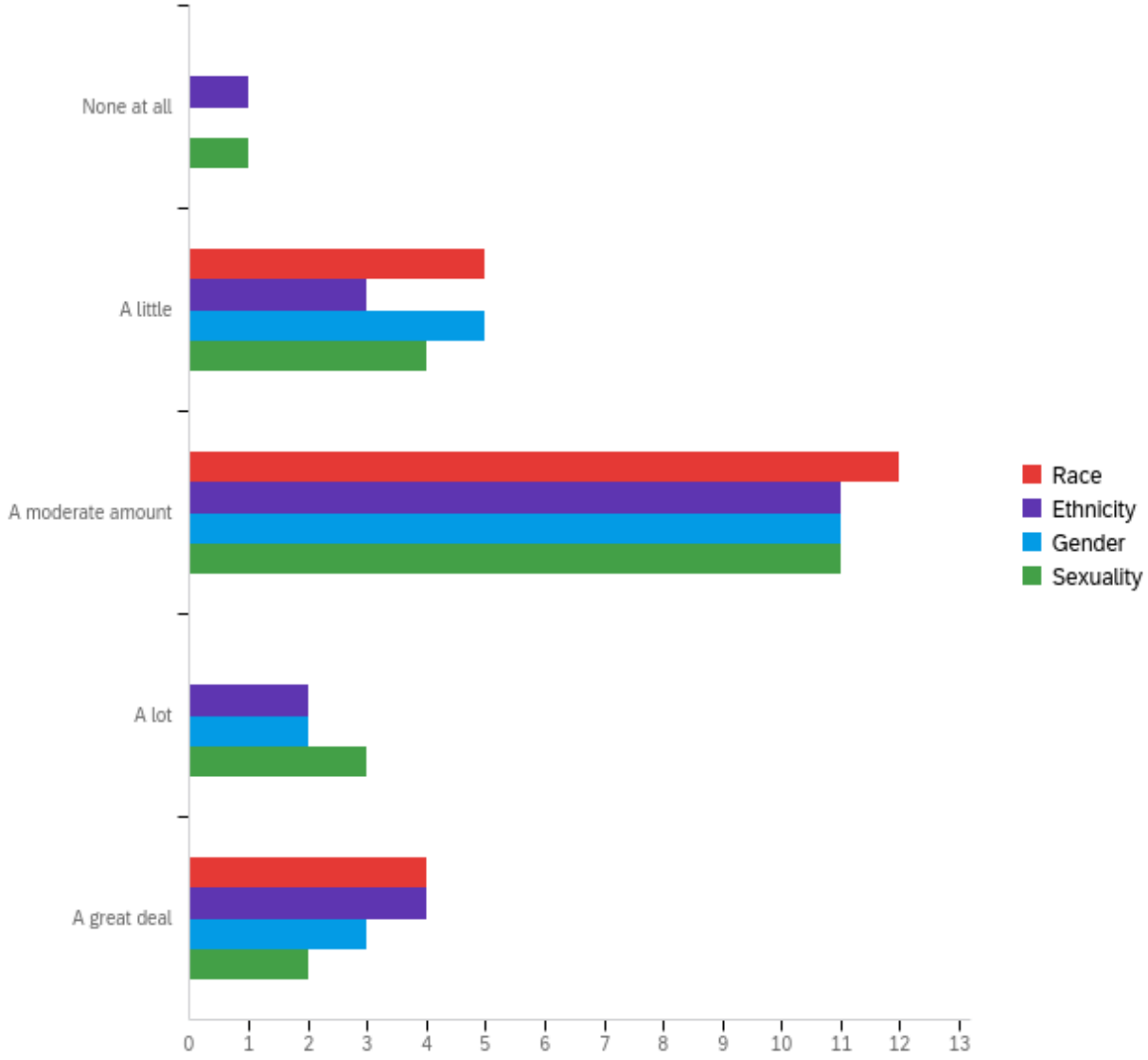
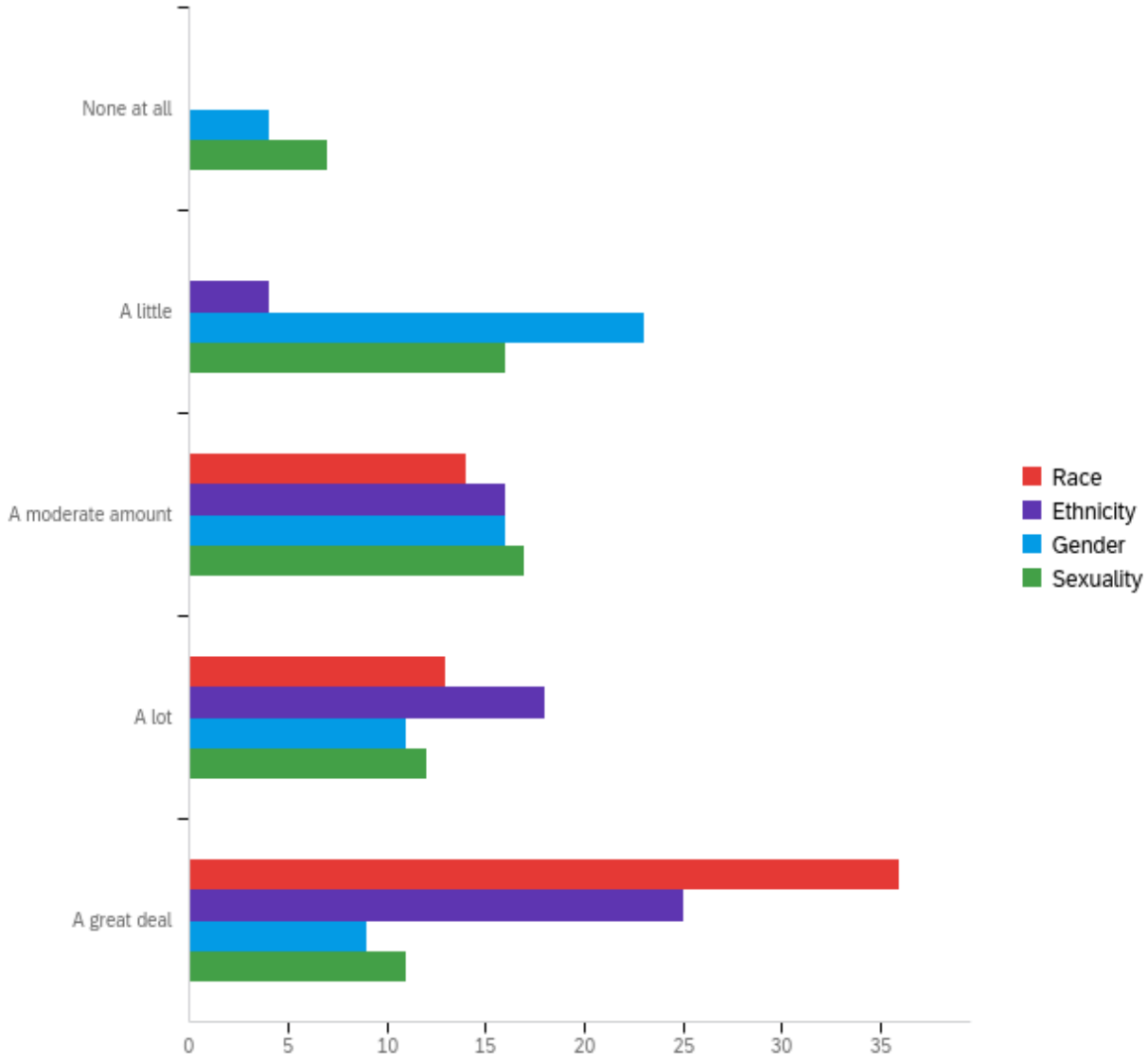
Race
Ethnicity
Gender
Sexuality

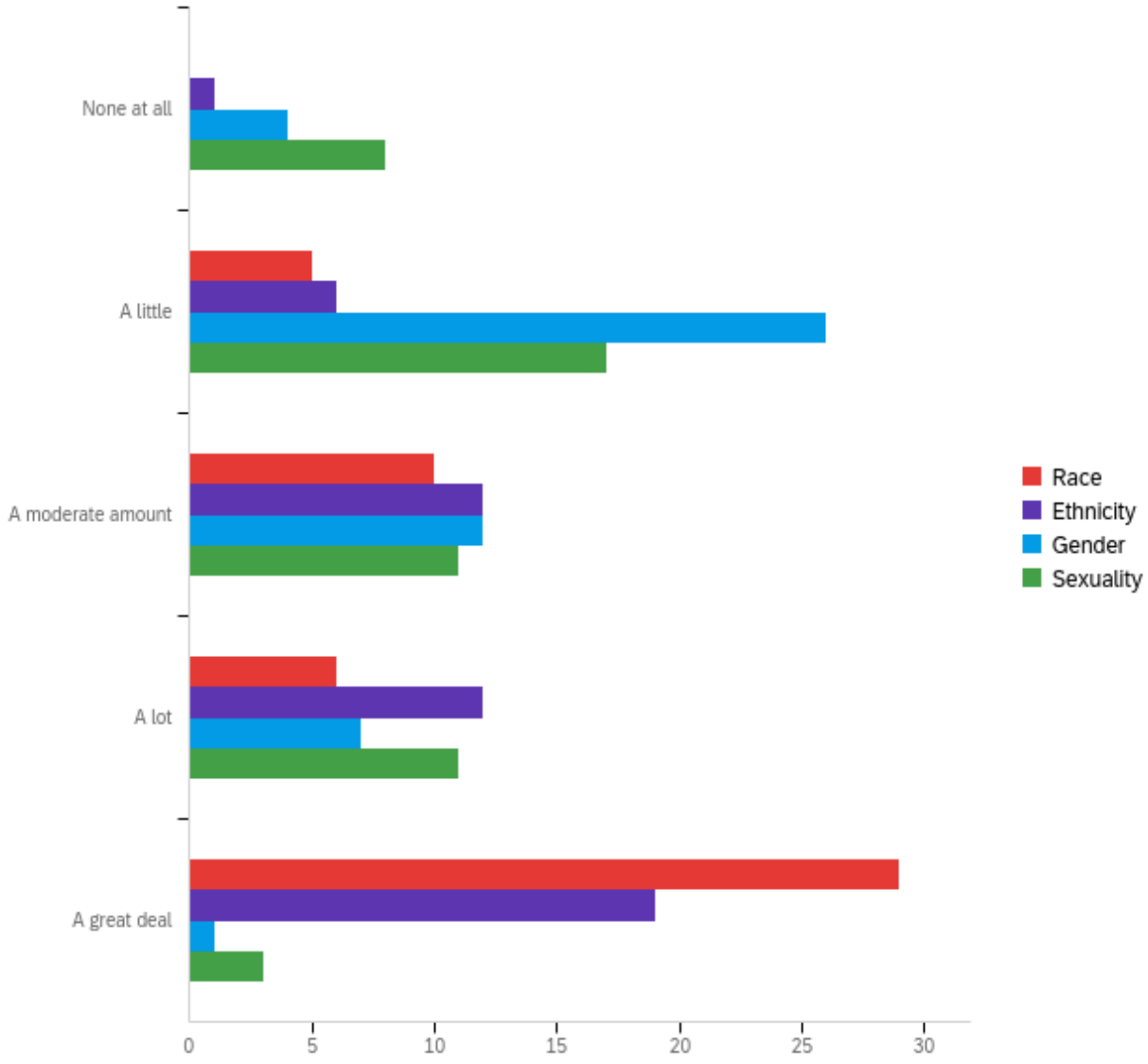
Marginalized Races:



Non-Marginalized Races:



Non-Male:


None at all
A little
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Race
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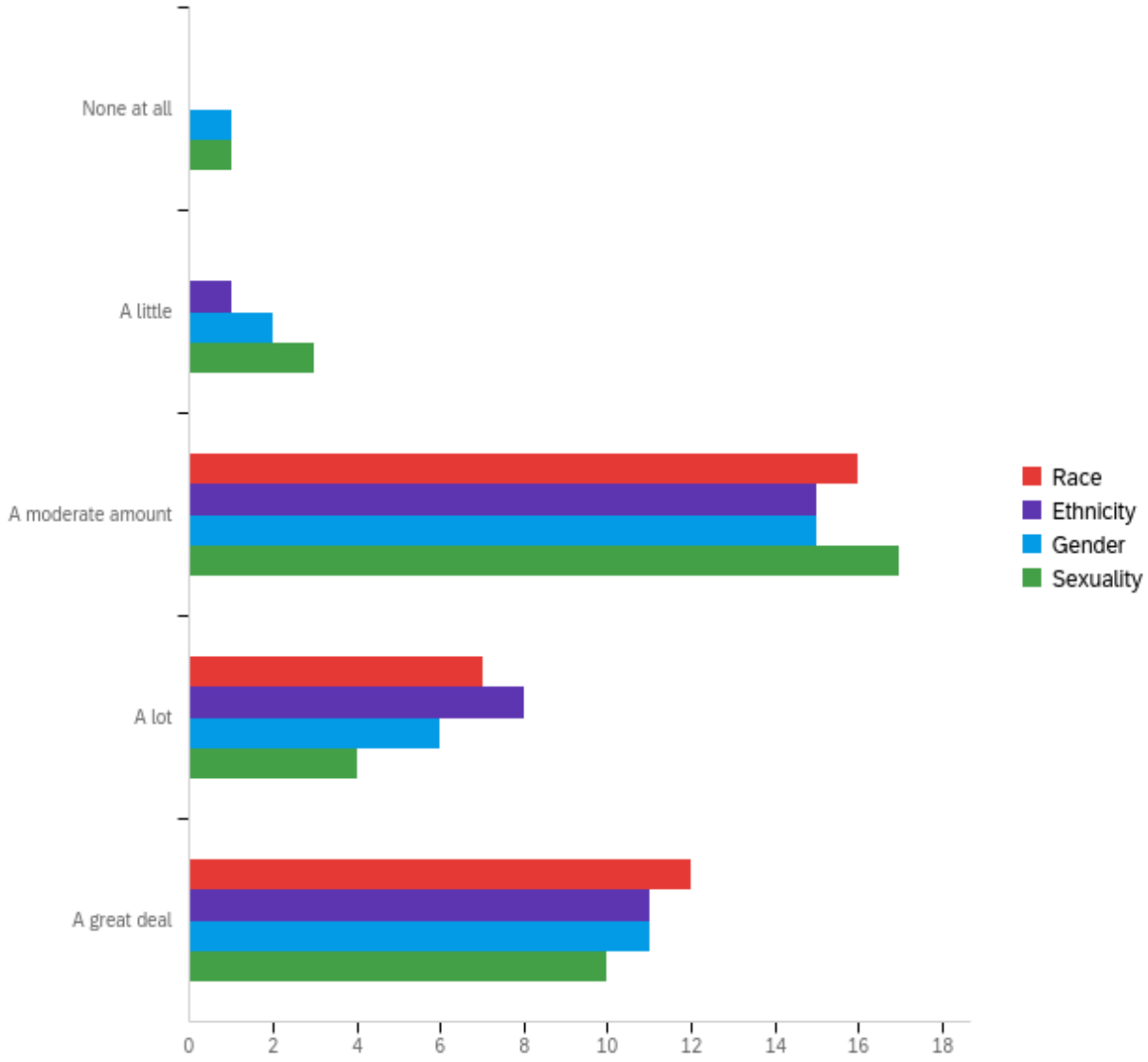
Gender
Sexuality

Male: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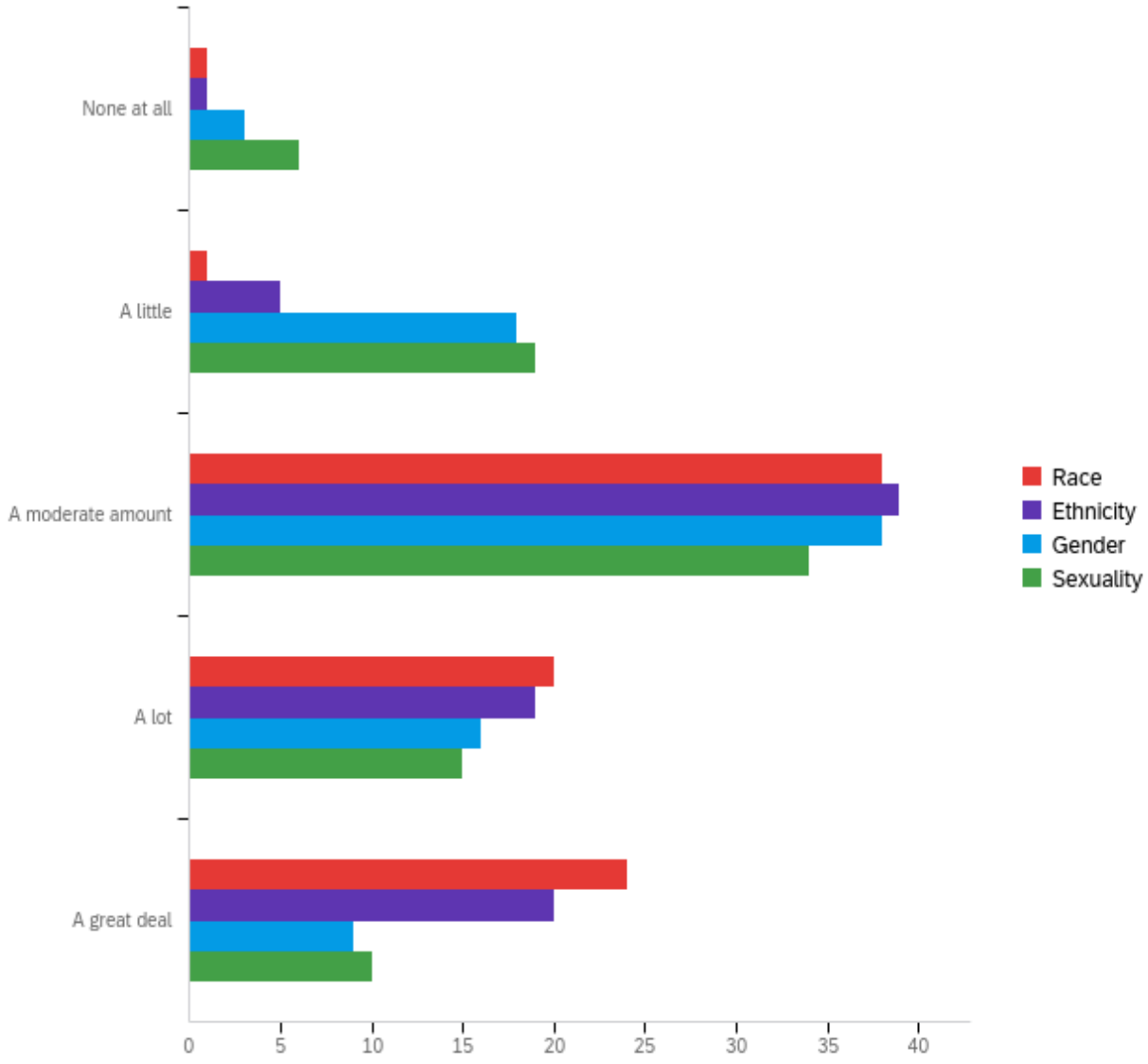
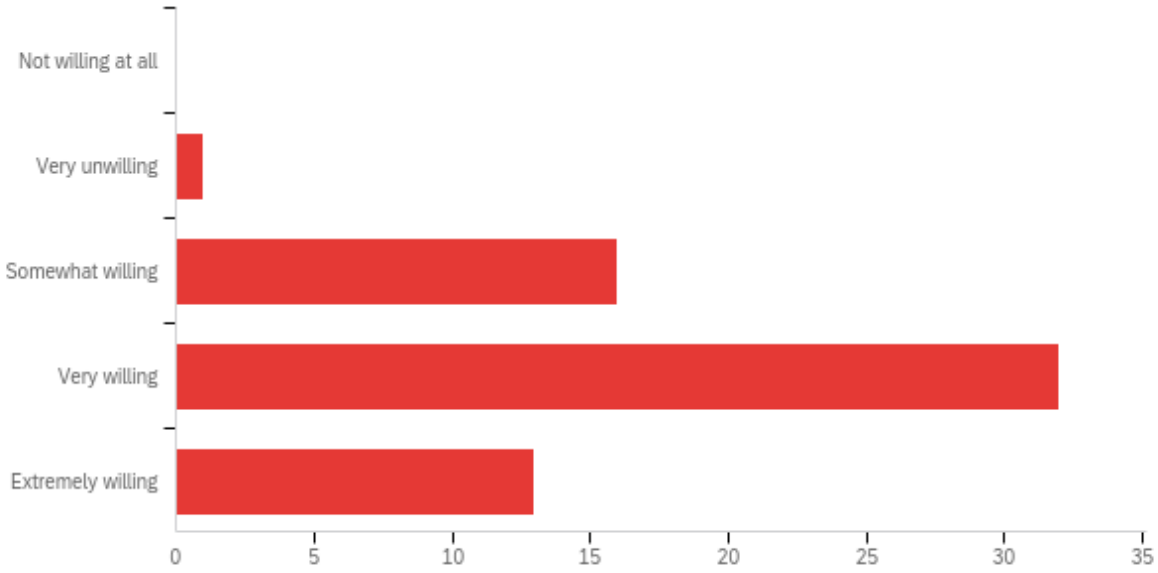
Race
Ethnicity
Gender
Sexuality

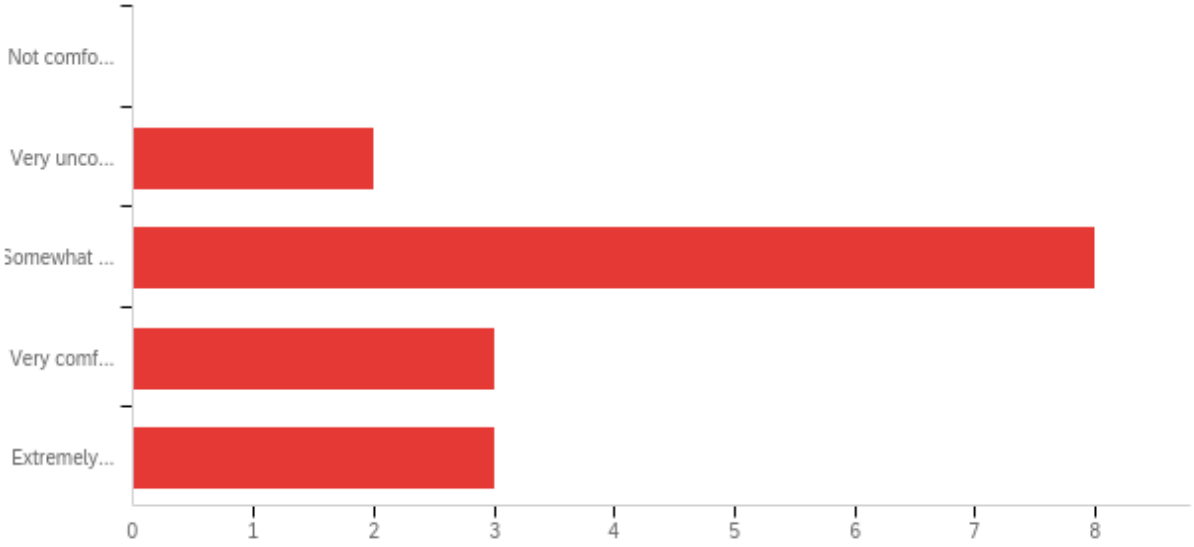
9Q6 Do you feel represented by student staff (ex. SAs, TAs) in the CS Department in the following categories: race, ethnicity, gender, and sexuality?



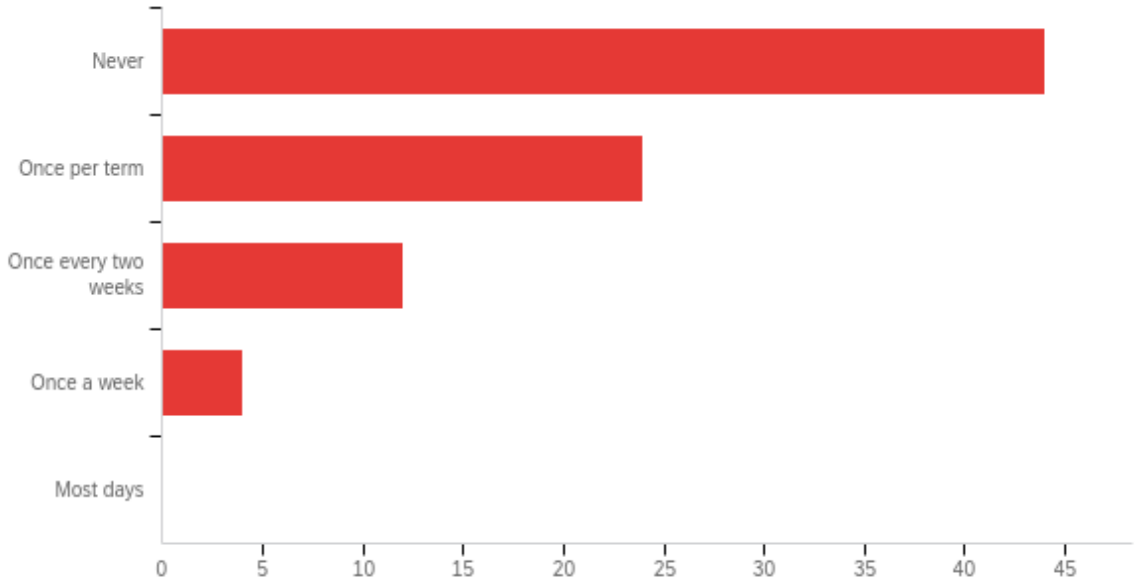
9Q7 When there was an emergency situation, how willing were professors to work with you to move deadlines or otherwise provide assistance? (1-5)



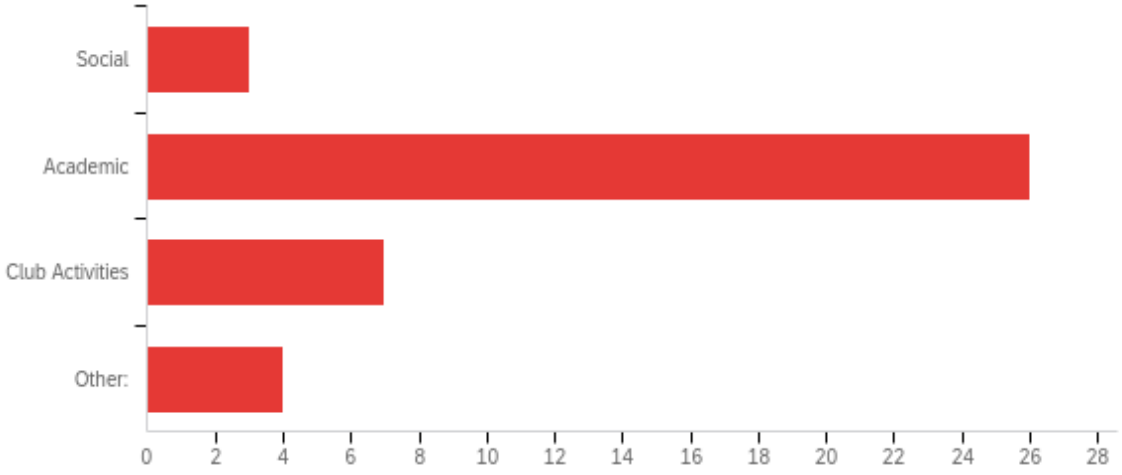
9Q8 Rate the following statement: when there was an emergency situation, I felt comfortable asking my professor for accomodations. (1-5)



10Q1 How regularly do you use Fuller Commons?



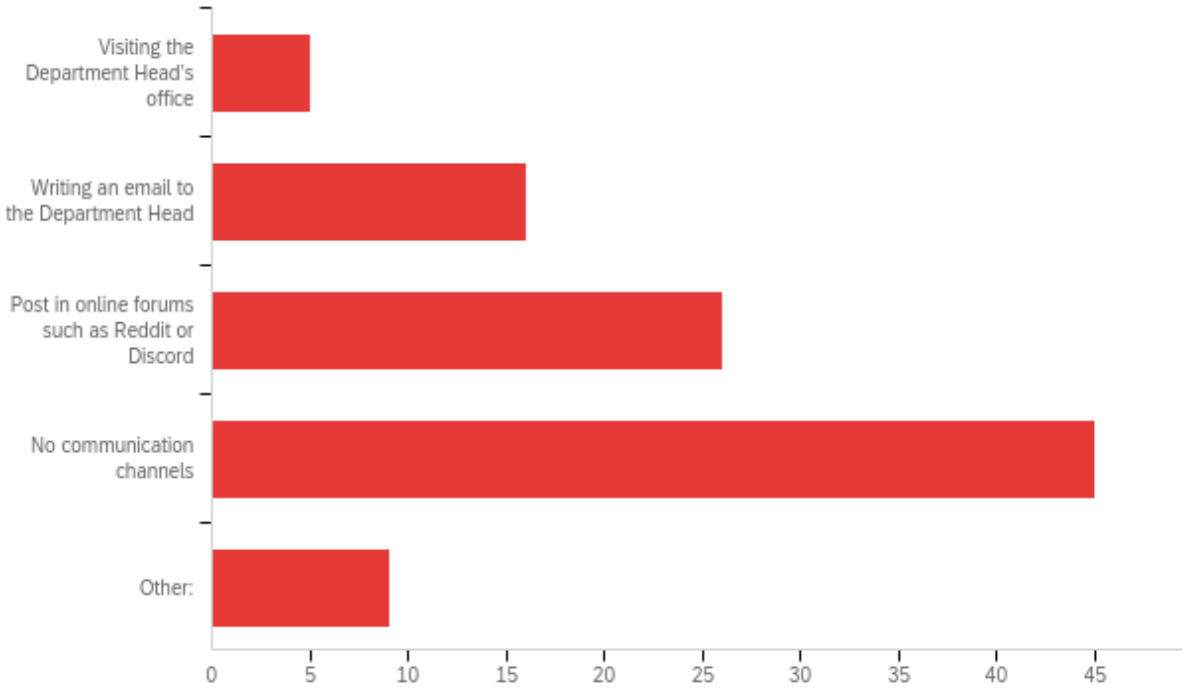
10Q2 What do you mainly use Fuller Commons for?



Other: Waiting for my next class, Burning the Midnight Oil, BTMO,

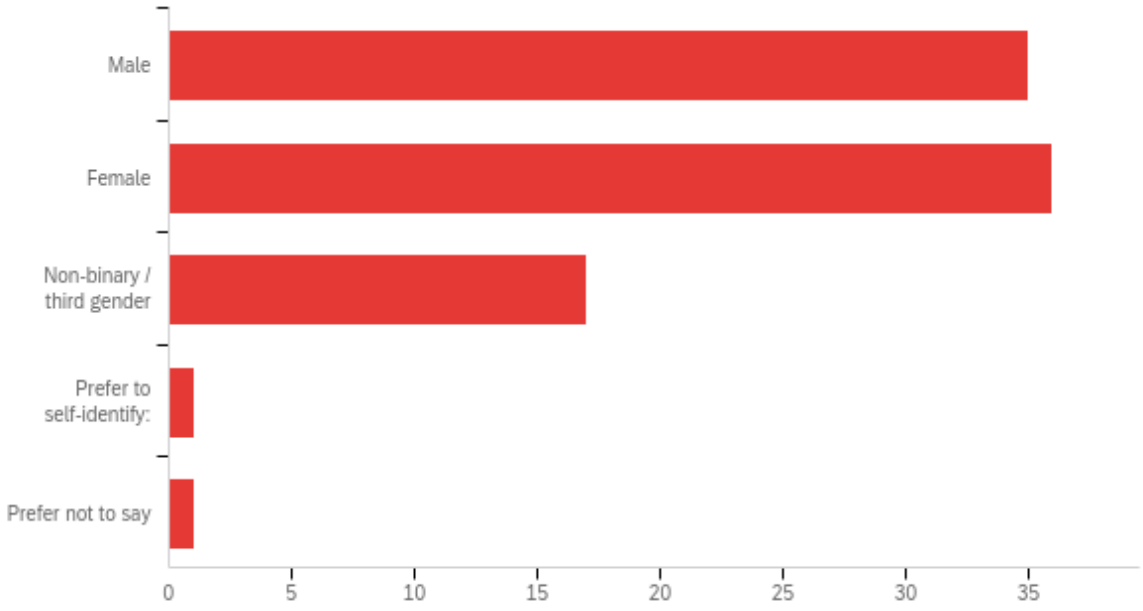
schoolwork/relaxation place

10Q3 When you have concerns with the Computer Science department, what communication channels do you use, if any? Check all that apply.



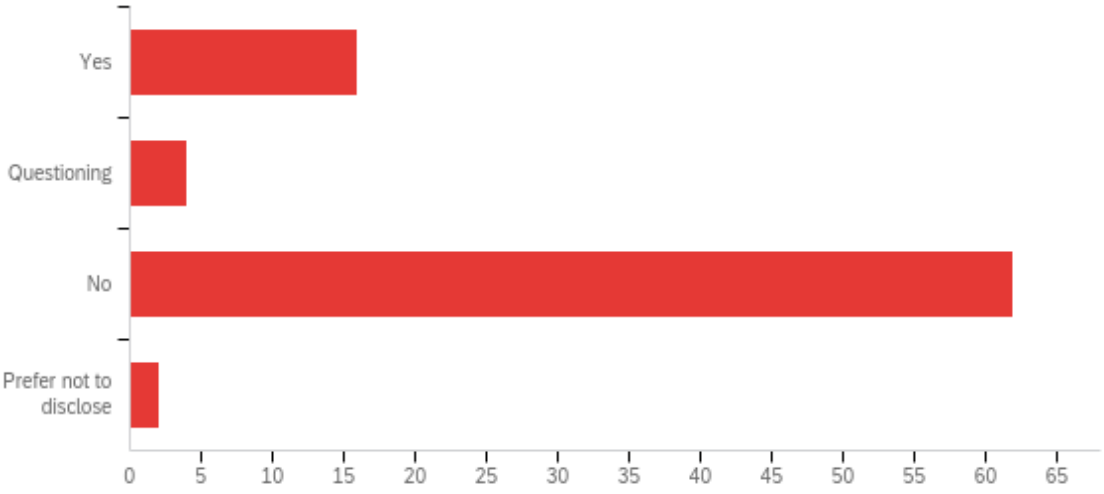
Other: [Professor Name], I emailed the SA coordinator once, Canvas comments, talking with faculty/staff, N/A

11Q1 How do you describe your gender identity? Check all that apply.

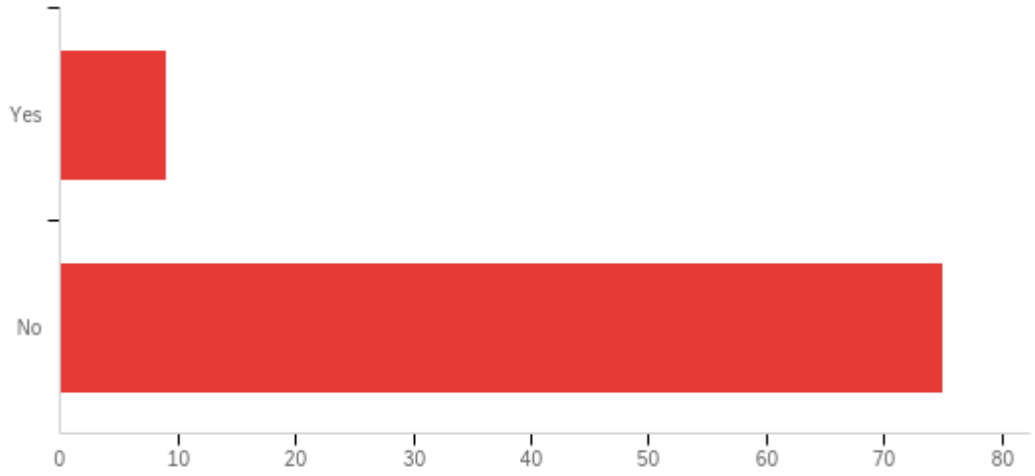


Prefer to self-identify: Genderfluid

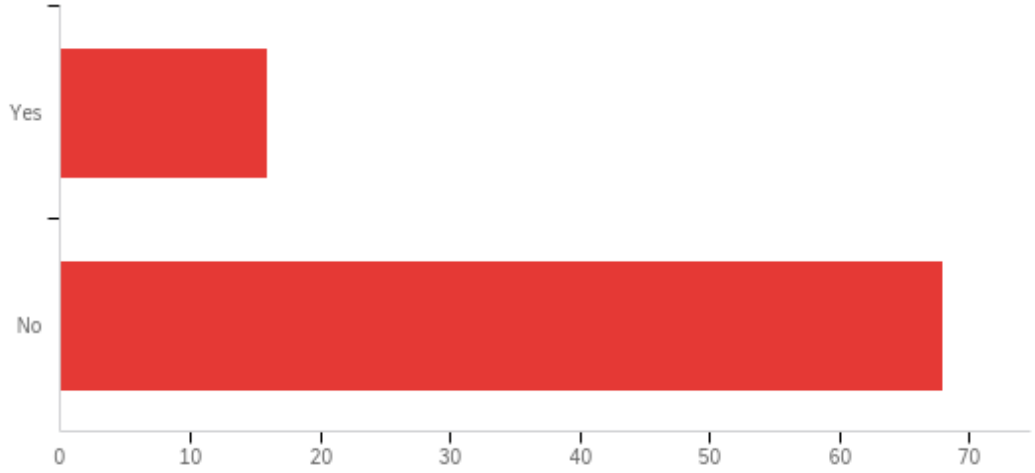
11Q2 Do you identify as transgender?



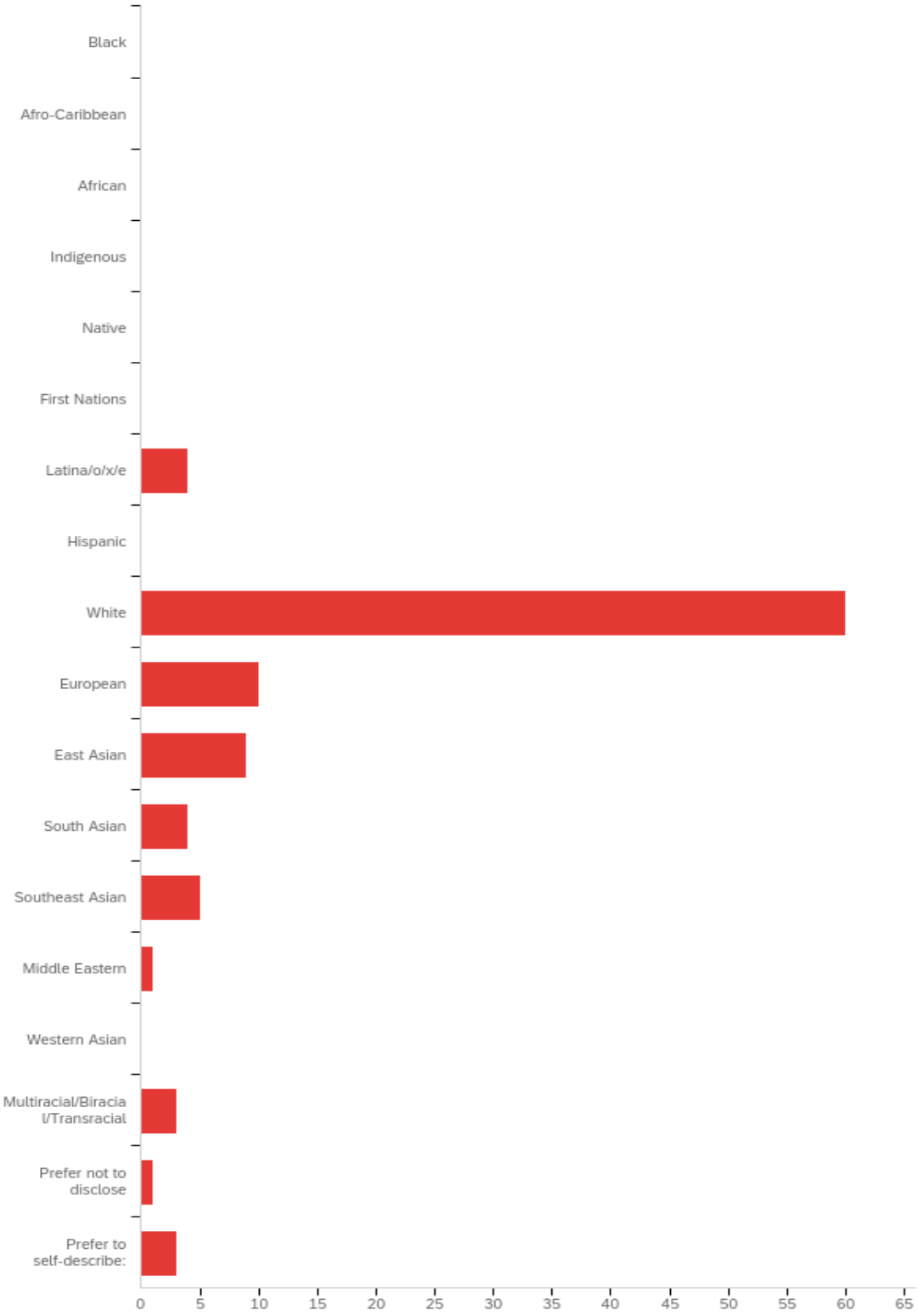
11Q3 Are you an international student?



11Q4 Are you the first in your family to attend college?

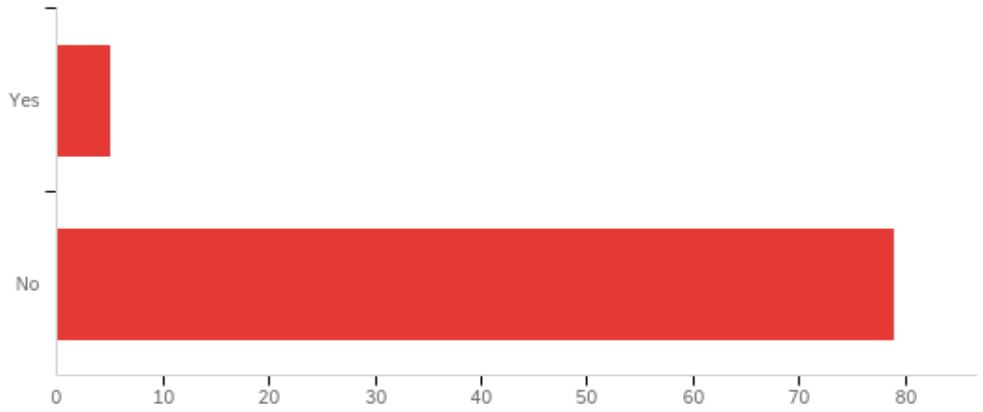


11Q5 What would you best describe yourself as? Check all that apply.

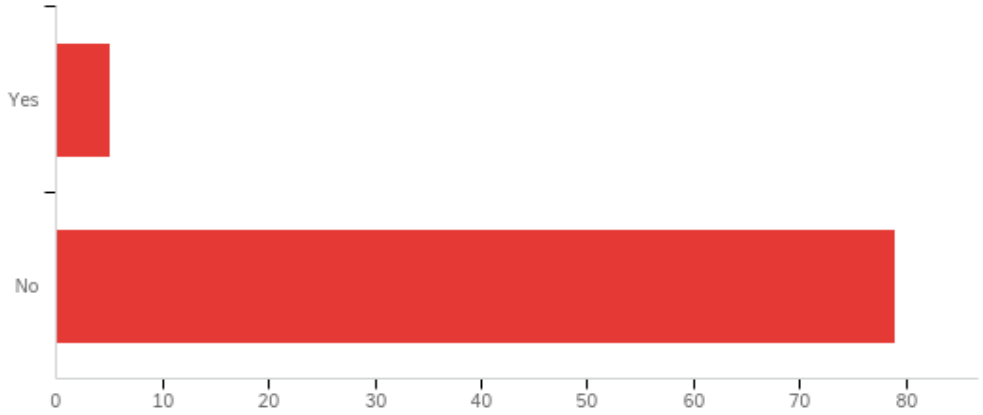


Prefer to self-describe: White suburban dad, Jewish, North African and White

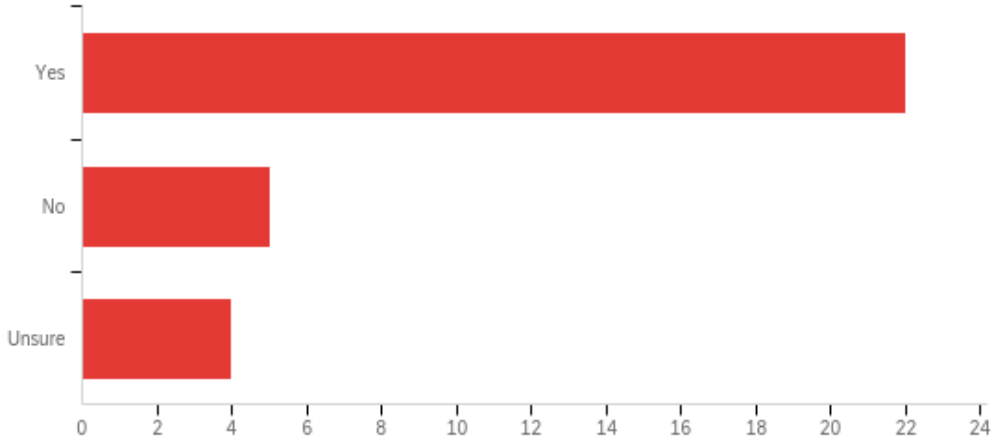
11Q6 Do you self-identify as having a disability?



11Q7 Do you have a physical disability?



11Q8 Would you consider your disability an “invisible disability,” meaning that other people may not see your disability externally?



8.3 Appendix C: Interview Questions Sorted by Group

8.3.1 Student Interview Questions

1. How would you describe the general atmosphere of the Computer Science department?
2. How much collaboration between students have you observed within your Computer Science courses?
3. Do you feel supported by your professors? Your peers? Your academic advisor?
4. Are there any resources that were created due to COVID policies that you would like to see continue being used?
5. What resources or support, if any, would help you be more successful as a student?
6. How has your identity impacted your CS experience, at all?
7. Are there any other things that you would like to discuss as a student in the CS Department?

8.3.2 Student Club Leader Interview Questions

1. What club are you an executive board member of?
2. What do meetings typically consist of?
3. How beginner-friendly do you rate your organization as?
4. How many people typically attend meetings?
    a. What are meeting engagement trends like throughout the year (ex. More in A term, fewer people in D-term, etc.)?
    b. How much interaction between students do you see at your meetings?
5. What have you tried to do to boost engagement?
6. Has your respective department provided any funding or advertising opportunities?
7. How much reach do you think the club has outside of its club members (i.e. do people know about it?)
8. What would you consider an indicator for your club being successful?
9. What direction would you like to see the club to develop in?
10. What resources or support, if any, would help you be successful in your position?

8.3.3 Computing Faculty Interview Questions

1. What courses do you teach? How long have you been at WPI?
2. What percentage of students come to office hours? How has this changed remote vs. in-person?
3. What are common barriers to success for students in your course? Have you seen any issues with collaboration among students (i.e. project partners having difficulties)?
4. How would you define diversity, equity, and inclusion?
5. Can you describe faculty culture in relation to DEI?
6. What communication channels do you use to interact with students? With teaching staff?
7. How are some ways you've promoted DEI in your classroom?
8. What resources or support, if any, would help you be successful in your position?
9. Are there any resources that were created due to COVID policies that you would like to see continue being used?
10. How would you describe the general CS community?

8.4 Student Interview Transcripts

8.4.1 Appendix D: Nonbinary IMGD Student

Interviewer: How would you describe the general atmosphere of the computer science department based on classes you've taken, people you've interacted with?

Student: This is a complicated question. I have actually really liked my computer science teachers. [One of my CS professors] is awesome. They were super accommodating to me and definitely had the funniest reaction to when I [had a medical event]. I sent them [an email that said] "Hey, just so you know, I won't be in class today because I [had a medical event]," and I sent it at 2am, and then three hours later, they wrote, "OMG good luck". I know it's not professional, but it was the best possible reaction I could've gotten. Everyone else said "OMG are you okay," but that reaction made my day, because I [had a medical event] and had to get surgery. [Another professor], they are new, I really like them a lot. I'mma be real, I have not been super paying attention in their class, so I'm not the best person to ask what theír classes are like, because I've already taken a course in C, so I don't need to super listen in all the time, but in terms of care for mental health and stuff like that, they're awesome.

S: I told them that I was having some family issues over Thanksgiving, and they got me a contact with someone who is [a similar identity] in the CS Department. If you have a test with them, but you feel like you need extra time or a separate location, you can literally just ask them, you don't need an accommodation letter, which I think is based. They're really cool and really nice. I haven't talked to a lot of the CS Department, they're a bit of an enigma. The one CS student I have interacted with messaged me over Zeemee, and they were giving mad incel energy, being super pretentious. [I said] a fun fact about me was that I'm six feet tall, because I feel like that's pretty abnormal to be AFAB and six feet tall. They were like, "I'll have you know, being six feet tall isn't even that impressive, and I'm actually five foot eleven and not insecure of my height whatsoever," I have no idea why.

S: The gender neutral signs for the Fuller bathroom keeps getting stolen, and that makes me feel unsafe. People here are super nice usually. I don't mean to be "anti-people's beliefs" or whatever, but when the pro-life people were making chalk signs like "save your baby", a bunch of other people got together and [wiped] it all down and wrote "you are loved", which I think is a lot more helpful. I was under the general impression that the overall community is super nice and friendly, and I don't know how many people are behind the gender neutral sign thing, but it's stupid, and I'm pissed about it. Fuller is [bad] enough as is. The elevator [makes me feel like] I'm going to be stuck in it, every time I use it. The colors on the inside of the picture [is] what you line insane asylums with, to make you more crazy. I feel like I'm losing my mind every time I set foot in that elevator. It's also slow.

S: I have a complaint for the IMGD department -- why do none of our classrooms have windows? Why is the IMGD 222 lab the only IMGD place with windows? Why is our other room in the basement, the sub basement? Why is it called the Zoo? It's called the Zoo so that everyone can come down and look at our suffering through the glass. I am begging you, if anything, just please make a nice IMGD place for the love of god.

I: How much collaboration in general in projects and what you've seen from other people, do you see from students in your CS courses?

S: In the first course I took with [a CS professor], CS 1004, they very heavily encouraged collaboration, but I did not collaborate with anyone, because it was quite literally the seventh intro to computer science class I've ever taken. If I have to do this with someone, I'm just going to be holding their hand the entire time, because I don't know how [to say], "I know the solution to this problem, but I'm going to let you figure it out, because I need you to feel like you're doing something". I don't know how to navigate that sort of nuance. For the class I'm currently taking, I do actually like how [my professor] has it set up, because in every single class we have collaboration with the people at our table, and every single class, we work together to do some sort of practice problem or whatever. However again, I did run into the same problem, which was "I know what I'm doing and nobody else does," so what I will say is "Hey, how do you think this should be solved?" And then they do it, and it's wrong, and I don't know how to [say] "you're wrong".

S: I've been a teacher before, I've taught sailing for four years-- however, it's very different to teach other people from the position of "I'm getting paid as a teacher to teach you", and "I'm just some guy in your class, and I'm going to tell you how to do this," because one of those is more pretentious than the other.

I: How supported do you feel by your peers in classes and out of classes [with respect to CS and IMGD?]

S: If you're talking about [non-CS computing department] and the art classes, I've met some people, I've talked to some people, I've had some friends, we've played Magic the Gathering, people have helped me in classes. In terms of Computer Science, I literally didn't talk to anyone in my class A-term, and at the beginning of B-term, there was this table with 2 people I sat at, and I asked this one person if they wanted to do labs with me, and they [said,] "Sorry, I'm already doing it with someone else, and then got up and left. Cool, awesome.

I just don't collaborate with many people, mostly because I don't feel the need to collaborate with other people; if I was struggling in a class, I would find someone else to work on things with, but I don't really feel the need to do work outside of the work I do on my own.

I: Do you feel supported by your academic advisor? Have you met your academic advisor?

S: I'm not gonna lie, I don't even know who my academic advisor is. I've just been doing everything myself, which is how I prefer it. I don't want to go talk to someone for an hour about what I want to do, what I don't want to do, blah blah blah.

I: Are there any resources that were created due to COVID policies that you would like to see continue to be used?

S: The COVID-19 vending machines are incredibly useful, and I think those should absolutely stay. I want to say that recording the lectures is useful, and they are to an extent, but it's one of those things where I feel like I would use it, but I don't. Before COVID, there was this whole culture of "if you are not actively dying and in need of a EMT, come to class, we don't care." I have had so much support from my professors, since after COVID, [if I said I had] a cold, [people would say] please stay away from me, I do not want you anywhere near me. The only person who was like that was my high school bio teacher, I had a cough once, and I usually sat in the front of the room, and they [said], "You need to sit in the back row," and I coughed twice more, and they said, "If you don't stop doing that, get out."

I: What resources, if any, would you think would help you be more successful as a student in general?

S: Honestly, I have gone to a few different schools in my life, and I have never felt more supported than I have at WPI. I have had very [terrible] experiences at previous schools, it's kind of like [comparing] a soggy cracker to a regular cracker--it's an amazing improvement, but it's still just a cracker. I don't know if it's just from my personal perspective, or if it's something other people feel, or if it's worse in some way, but in all honesty, I have never succeeded as much academically, mentally, socially as I have at WPI, and life is really great now. I'm really happy about it.

I: How has your identity impacted your CS experience at all? I know you mentioned [your interactions with some weird person] earlier.

S: Yeah, there was that guy, it was because I had a very feminine photo as my profile picture, so I was pretty sure that they thought, "If I insult this person, then they will come crawling to me, because I am a misogynist." I guess this wasn't super common, but when I was in the transfer

NSO group, there was one guy, and I don't know what major he was, but we were all going around saying our name and pronouns and major, and he said, "Uh, I'm a man?" [My thoughts were] okay, good for you, what are your pronouns? I don't know what you want, if you're in college and don't know what pronouns are, I'm concerned for not only your success but also the screening process.

S: This isn't CS-specific, but when I was in the wheelchair because of my [medical event], people didn't talk to me. People would ignore me if I asked for something. One experience was that I was going down the [East Hall] elevator and walking outside, and this guy stopped to hold the door open for me, and when he turned back and saw that I was in a wheelchair, he left. He walked away. The most ironic part of that, was that I caught up with him in Unity and rode the elevator up with him, so it literally didn't matter. I was so tempted to turn to him and say, "Did those two extra seconds help?" I was so pissed, he was willing to open the door for other people, but he wasn't willing to if I was in a wheelchair.

S: I have also found that certain people will treat me differently when I let them know I'm autistic, which is very weird to me because they talked to me before they knew I was autistic, and now I told them [I'm] autistic, and now [they think,] "Uh oh, that's a disabled person," and I'm still the same person you're having a conversation with this whole time. This knowledge should not affect anything. People will assume that I need to be told things more gently or indirectly, which is quite annoying, because what helps is direct, blunt communication. If you [say], "I don't mean to be rude, but there are dirty dishes in the sink," to me, that is you telling me something. You are giving me the information that there are dirty dishes in the sink. My answer to that will be "OK," because you did not ask me a question, you just told me a fact. "What would you like me to do about that?" is a question that I can ask, but if you are not giving me information and a question, I cannot provide any insight.

I: Is that more generally seen with peers, or have professors done that with you at all?

S: I don't believe I've had any professors do that with me. I think I've had some [faculty/staff members] say "Okay, okay," [when being told that I'm autistic.] [In terms of] positive experiences, I got pulled aside by one of the 3D modeling professors to be a part of Friends of Color to make trans 3D models, so that's really cool. I've also made a lot of friends due to being trans and gay, and I feel a lot more confident about being myself. I actually started HRT two weeks ago which is awesome. As of general, people have been really supportive of me being trans and use of my pronouns, but when it comes to disability, a big problem is that nobody is ever taught how to talk to disabled people. I think that needs to change somehow. I don't know how--maybe make like a pamphlet to hand out to people, or some kind of presentation, but there needs to be a change around that, I think.

I: Is there anything else that you would like to mention that we didn't cover in questions?

S: I really love the incomplete system. I was at a different school where they were like, "If you have an incomplete, that means you have two weeks to finish everything," [which feels] so short! Having a longer period of time is really nice. I don't know, everything's really cool. Hire more counselors for the SDCC please. There's two, I think, and I tried calling them last week, [to which they said], "We don't have any appointments." I [told them], "but I'm sad," and they [responded], "That sucks, do you want to come in tomorrow?"

S: Another thing is that apparently this was here last year, but I really [would] like if they brought it back: a neurodivergent group counseling from the SDCC, because I would love to talk about how being neurodivergent has affected my time here and hear from other people about it.

8.4.2 Appendix E: Male CS Student

Interviewer: How would you describe the general atmosphere of the CS Department?

Student: Personally, I've never had a problem. Lately, I know that people have been tearing down the gender-neutral signs, so obviously it hasn't been a problem for me, but I'm sure it has been a problem for them. As for me, though, I have not had any issues.

I: How much collaboration between students have you observed within your computer science classes?

S: Personally, I see people collaborating in Fuller Commons and the stairwells -- I'd say that most CS courses, you can collaborate anyways. At least in my experience, I was able to collaborate a lot. I know some classes have individual parts as well as collaborative parts. I think the only CS class that doesn't have collaboration might be Discrete Math. Mostly, I've seen a lot of collaboration. Honestly, it's probably how I've gotten so far.

I: Do you feel supported by the CS community? Do you feel supported by your professors?

S: I do, yeah.

I: Do you feel supported by your peers?

S: I do, yeah. All the professors I had so far, especially [my professor for Operating Systems], since OS is probably the hardest course I've taken so far, they were super supportive in office hours, and even outside of classes a little bit. Professors who use Discord, I think it's helpful that

they've been reaching out to the community and me in that way, because we all use Discord now, so I like how they're taking that extra step to connect with students.

I: I know we have a lovely CS Discord, do you engage in that at all, or just the general Discord community?

S: I use Discord for specific classes as opposed to the general CS Discord, I don't use it as much. I know other people do use it, but I don't use it.

I: How supported do you feel by your academic advisor?

S: Oh, my academic advisor is [a notable CS professor], so I feel totally supported.

I: I know that you have your major advisor, and then there's also the other person.

S: Oh, [this professor]? Is that my academic advisor? Either way, they have been helpful too. I haven't reached out to them as much, but my advisors are great.

I: Are there any resources that were created due to COVID policies that you'd like to see continue being used?

S: Classes being recorded is helpful. Sometimes I can't make every single class, or even if I do make the class and I want to [know what the professor said in this class], it's helpful to go back. I know many people aren't testing anymore, so it's hard for WPI -- if COVID gets bad again [to do now], hopefully as long as they keep sanitizing everything, that's nice. In the rec center, they used to have bleach wipes, but they've taken those away, and now you just have spray bottles. It's pretty gross. How effective is it? Probably not really effective.

I: What resources or support, if any, would help you be more successful as a student?

S: I don't think anything in particular, but for the [SFS] program we have a mentorship [program]. It really depends on how many people are interested, I think, but yeah, some type of mentorship program [for the CS Department], whether it's specifically profession or for everyone, I don't know, just an idea.

I: How has your identity impacted your CS experience at WPI, if at all?

S: Nothing negative has happened on my behalf. I'm a straight white male, so honestly, things are in my favor, which honestly, that's just how it is, but I've not had any negative experiences like other people.

I: Is there anything else that you wanted to cover?

S: I personally did not like Discrete Math, but that's just because I don't like theory. I did not like Systems. I hope for the better, hopefully people in Systems will be learning C to better prepare them for OS. My systems class didn't quite prepare me for OS that well and made it much more difficult to make it through OS. I was learning C again and going through OS at the same time, so it was kind of a struggle. In terms of classes, that was difficult. Otherwise, I've had pretty good experiences. I love my Software Engineering class right now, all the hard classes with [these professors], the professors have been super supportive. Even in the most difficult classes, I've had great support from those professors.

I: Did you feel prepared for those classes, did you know what you were going into?

S: Mostly because I asked other classmates, so I would ask them their experience and what to expect, but otherwise, yeah. I kinda understood what would be coming, even in Operating Systems, even if I wasn't super prepared, I knew what to expect. I know this course would be a hard workload, in D-term I'm taking Social Imps, and I know that will be [difficult].

8.4.3 Appendix F: Female CS Student

Interviewer: How would you describe the general atmosphere of the CS Department?

Student: I feel like there's basically no community in the CS Department. There is no CS community. Because of my area of research, I end up very closely affiliated with the math department. The level of difference [between the math community and CS community] is so high, because the math community is so tight-knit, even looking at other majors as well, math has a math club, data science has a data science club, but there's no computer science club. Either you make it into UPE, or you don't, and that determines whether or not you get to participate in the computer science community at all.

S: I use she/her pronouns, but I don't always feel comfortable in women's spaces, so I don't want to join those women-only clubs, because it just doesn't feel right to me. I feel like in that regard, I haven't been able to really participate in whatever computer science community exists. I know that BTMO is always talking, but that's really it. The general atmosphere is that there is no atmosphere because it doesn't exist.

I: Do you use the CS Discord at all?

S: My hot secret is that I am a prolific Discord user, and the WPI CS server has been a cursed entity in my mind for a long time. It never sat right to me, because the owner graduated before the class of 2023 even got here, in 2019/2020, but I think [the server owner] has been gone [from WPI] for four years and still owns the server. He will not let anyone else take over, and I don't want to interact there as much because it just has such a weird vibe. Their stance on moderation is, I don't vibe with it.

I: How much collaboration between students from your personal experience as well as the classroom have you observed within your CS courses?

S: I feel like the collaboration really depends on how much the class itself, if you're in a group project, the level of collaboration is going to be high, [otherwise,] it's going to be low. When I was taking the intro courses, in [CS] 1101, I did that all by myself and didn't have a partner, and [thought], well, this would've been a hell of a lot easier if I had someone else doing the work, so in 2102, I was like, okay, I'll have a partner now. I feel like overall, in my entire group project experience, partners for those classes, partners for Systems, partners for Algorithms, partners for Networks, etc, I just don't have positive experiences generally with any of them. I've never had a "we're clicking, we're on the same skill level, we're battling this out together". From the beginning, it's either I'm overqualified for whatever thing, either I'm doing the hard carrying, or someone else is carrying me. There have definitely been "I'm having a certified woman moment right now," like what am I going to say, "This person is consistently an asshole to me and nobody else, this person is blaming every problem on me and nobody else? It's just, eh. It's never been overt enough to do anything about it, but it's still there.

I: Would you say that collaboration is worse in courses where you're forced to be in groups in courses?

S: Honestly, I have been really bad at choosing partners for the entire time. I feel like every time, I think someone will be a good partner, and then it ends up being a horrible mistake for some reason. To give an example, Networks was fine, one of my partners was on the same level [of CS experience] as me, but [this person] is not a group partner. He'll do all the work for you, but it's not an enjoyable experience. I chose that, I chose my Soft Eng team, and that was also not good. I honestly can't think of any random partnerships that I've had, really. Well, going way back, for [CS] 2102, I went random for a partner, and that was a huge mistake. That was just a situation where I already knew Java going into the class, with this person who had never programmed before, and it was just an unenjoyable experience, because I wasn't learning anything, he wasn't learning anything, and yeah.

I: Would you say having skill-based random assignment would be good?

S: Yeah, a matchmaking system might be good. I think [some professor] does that for Soft Eng, where that makes sense to me -- it shouldn't be allowed to be completely arbitrary, because then you end up in situations that are just not good for anybody. You know what they say, pairing strong students with weak students helps them learn, uh, I kinda disagree with that one. I have not experienced that one.

I: How do you think professors facilitate, when it comes to working with partners?

S: I think for the most part, in my classwork experiences, it's all been like we're very much left to our own devices to find teams, and make them, and if you don't do that part, get random generated [partners via] InstructAssist, those are the two options there.

I: Do you feel supported by your professors in classes, in office hours, in classroom, lecture environments, etc?

S: I think that one also depends a lot. I usually do pretty well, so I don't necessarily [think] I'm a good person to comment on such a part, because I haven't often needed it. I will say that from some perspectives, like my thesis advisor is much more supportive of me and my issues than other professors I've worked with. There's a queer experience element there, there's a neurodivergence experience there, and when you share that with a professor, it's like, okay, you can kinda get a hold of it better. I had some really positive [experiences]. And then on the other end, it's knowing how to manage a classroom in such a way that this is a positive experience for other people. Not to hate on Networks some more, but the actual way the class is run started off pretty rough, and then I feel like it got better over time. That class had a horrible [gender] ratio, that class had six women in total, and it's a sixty person class, and a lot of times, the vibes was, that room was full of testosterone, and it wasn't a good vibe, and I think toward the end of the class, he kinda [???] to get it to be more reasonable state. Even though I never talked about that, I never brought that up to him, except maybe I typed it in the course reports, being like "This is disruptive," like that kind of stuff, taking that kind of feedback that doesn't come directly from somebody's mouth, like I appreciate that. I'd say that it depends from professor to professor.

I: How supported do you feel by your peers here? Just like, the general WPI community or the CS community?

S: I've found my group of people who I vibe with and support me, right? I've got some friends here, similar experiences to me, and are in a similar position, similar background, whatever. But I will say that, coming to WPI, I've always been kind of a woman in STEM, basically since day one, in high school, I was all about physics, I was one of two girls in my AP physics class, and in high school, that was all fine. But when I got to WPI, I feel like that was the first time I really noticed like, "Wow, some people really don't respect me because I'm a woman, some people

really don't feel like I exist." I think that like, depending on who you are, that can be very impactful, right? Because I've had my network of people who are like me and are able to be like, "Yeah, that's ridiculous," and be supportive. It kind of cancels out the people trying to push you down, even if it's unintentional. They're so blinded by their own struggles that they don't even realize that they're saying really false and hurtful things.

I: Do you feel supported by your academic or major advisor? Or for you, also thesis advisor?

S: I've never met my academic advisor, so I can't particularly comment on that. I've been shuffled around, like major advisors, 3 or 4 times now. I started with a person that was kinda like, I went to them [and said,] "I want to do BS/MS" at the end of freshman year, and they were like, "Here, watch this hour and a half long video, I don't know anything about this." So I switched advisors. My second advisor, [notable CS professor], was very helpful, very great. I didn't go to him much for advice, but he was able to look over my schedule and say that this looks valid, and I felt like I could trust that. Now I have [this CS professor] who I've never interacted with at all because I got shuffled around the beginning of this year, so I don't really know. I'd say net positive, because they've all been able to help me out in some way, just some were more helpful than others.

S: Sometimes it's nice to chit chat with your advisor and be able to talk about issues with the department, and be like, "Hey!" My thesis advisor is great, I think that it's been very helpful to be connected with someone who is also very openly different, and be able to be myself and not have to be like "Okay, am I doing my weird cat thing right now or not?" If I get so stressed [that] I rub the skin off my fingers, they'll be like, "Here's a band-aid" and not, "That's weird." So that's been very positive. But I will say, in the computer science department, that's a very small minority of professors. There's [an IMGD professor] in the IMGD department who's also a hit, but in the true CS Department, if you need someone who's very in touch with what the experience is like, there's not a lot of options. I think that having someone who is in these really, really technical areas, but still representation, is really important.

I: Are there any resources that were created due to COVID policies, or maintained due to COVID policies that you'd like to see being used?

S: I definitely benefited from the pandemic classroom experience being online, but I feel like I don't really know if there's anything specific that I would want to see that they brought back. For me, the added flexibility came at a very high cost.

I: What resources or support, if any, would help you become a more successful student?

S: Okay, so this is a crazy idea. I didn't come up with this, this is something my partner came up with, but they came up with it for the math department, but I think that the same thing would be very very useful for CS. A lot of people in CS do not get into research, but research is kind of what it's all about, right? If you want to go to grad school, I feel like the pipeline to grad school from WPI is really hard to get through.

S: The idea is to have, A) make the colloquiums better. It's the CS/DS colloquium, can we please get some people who do CS for once? And then, make it a graduation requirement. A zero credit hour requirement to attend a colloquium event every year, or maybe even, not like an ID2050 but a PQP, like it doesn't really bear credit, but they have to show up somewhere for an hour every week and hear about a professor talking about what research they do, and what they're interested in. I knew I wanted to do BS/MS from the very beginning, but I didn't know what I was interested in, and I didn't find what I was interested in until A-term of my junior year when I took a class on a complete whim because I needed it to graduate, and I had no idea what it was going to be, and it ended up being something that completely sent me on the path to getting to where I am today. But like, it was kind of at the last minute, I was going to graduate. I was panicking not knowing what I wanted to do, so I think that having more exposure to research as an undergraduate would be extremely useful, and would've greatly helped me.

S: You take Discrete, you take Foundations, but you don't get into the cutting edge of what theoretical CS is until you are taking classes that aren't necessary anymore and are very basically completely unrelated to what Discrete and Foundations were like.

I: How has your identity impacted your CS experience, if at all?

S: There are a few characters in my WPI experience who have caused problems for me, like you see them and your heart kind of drops. Like, oh my god, if I could never seen any of these guys again, I'd be so happy. Beyond that, taking another step, something that I have loathed but keeps happening to me, is that any person you meet, they're nice to you, and they're your friend, you kind of have it in the back of your mind, like, do they want to [have personal relations] with me? That's happened to me four times now, I have no friends! I have no friends because eventually you know, two years later, they told me they want to [have personal relations] with me, and I'm like "[explicative], I thought we were friends!" That's like, not the same group of people who I never want to see again. The people who I never want to see again are people who were so creepy to me, creating new Discord accounts to DM me, to ask me questions, like all of that. Yep.

I: Are there any things you'd like to add?

C: It's mostly because I have so many takes on this. I have to go say all these things, because, I don't know. CS has a major culture problem. It's a huge problem. All of these things add up. It becomes a very lonely, very very lonely place for women, if I didn't have friends who are all different majors by the way, most of them are CS majors, but these people are more cybersecurity-oriented, which is kind of in its own, I feel like it's separate from the CS major. People in cybersecurity, people in math, people in data science, who are all much more connected than I am to [the CS community]. Another person who's just a CS major with no other interests? No. The only people who are interested in programming languages are people I don't want to talk to.

8.4.4 Appendix G: Female CS/RBE Student

Interviewer: How would you describe the general atmosphere of the CS Department?

Student: It's definitely a collection of professors that everybody loves, like you mention a name, and somebody would be like "ohh, I had them, they were so cool!" I know when my girlfriend was telling me she was going to take algos, I was like, "Who are you taking with," because I had [this professor] for algos in d-term last year, and I was like, please have [this professor], please have [this professor], you gotta see the psychedelic goat chart! So a lot of professors are pretty hyped up, but there are also professors that are like, "ugh". One of them, without naming names, has since left WPI... I remember my partner had them last term, they were just ranting about them and how the class was awful, it wasn't hard, just confusing. Professors, there are some really good ones, there are some bad ones, plenty of mixed bags, like this professor was good for this class, but maybe for another class they weren't so good, so it's about what I would expect out of any department at WPI, that you have some good professors and some professors that aren't so good. With respect to the students, I don't feel a strong connection to the CS Department as I do with RBE. RBE, I know people by name, and I interact with them in and out of class; CS, I get more the feeling that, I run into people who are CS majors, that happens a lot, I see some of the same people in some of my classes, but I don't really interact with them.

I: How much collaboration between students have you observed within your CS courses?

S: For CS, I remember my object oriented class, it was encouraged to work with at least one other student, you got extra credit if you had the same homework partner for the term, so it's definitely encouraged. I remember in Algos, it's kind of like "You should submit your own assignments, but you can say in the comments [that you] worked with these people", so it's encouraged and allowed, but not necessarily required. After object-oriented, I always did my assignments by myself. Maybe reaching out in Discord chats, just asking "Hey, I don't

understand this," but really looking less towards my CS classmates and looking more toward online solutions and help or to TAs.

I: Do you feel supported by professors in class and outside of class?

S: Yeah, I'd say so. My experience with CS professors is a little limited, but I remember [typically 2000-level course CS professors] were supportive, they would adjust deadlines to ease pressure. [This characterful professor] not as much, he says some things that are a little questionable, sometimes he says something that's a little out of pocket. The way he teaches Discrete is like, you could literally just not show up ever. If you learn the content, do the pre-recorded lectures, and then go in class for the quizzes and the exam, you can still get an A. I wasn't as impressed there, but I've heard other professors are also really supportive, like [this CS professor].

I: Do you feel supported by your peers in CS and outside of CS as well, say the larger RBE community?

S: In CS, again, I don't talk to CS majors as much, there's not the sense of people competing against each other. People will, before class starts, talk about homework a little bit and just offer solutions to each other, or tips or things they did. It's not a competitive environment, it is helpful, at least a little bit collaborative. But in RBE, pair support is what makes the major work. The SAs are just the key to the major, they make it work. You'll see that if one team finishes their project earlier than the others finish theirs, sometimes they'll just stick around and wander to other teams and make suggestions and stuff. I think this applies to both CS and RBE, we're all in it together, we're just trying to get the same degree.

I: How do you think you would compare the two, just overall?

S: RBE is definitely more supportive, at least between students. It's kind of the foundation of what keeps RBE majors going, it's the SAs, having extra office hours. Whereas CS, it's a little more on your own. You can find classmates to help you, you can find friends to help you, it's not that there's no resources, most people just kinda stick it out themselves.

I: How often do you interact with the general WPI community, the CS community, the RBE community through Discord?

S: I tend to lurk and check the RBE Discord and main Discord fairly frequently. I don't check the CS discord as often, I find that it's not very active, and the people who use it tend to be much higher knowledge there, so I can't really help with anything. But because I am a lab assistant for the RBE Department, I check it probably because of that, just in case someone has questions

about materials for things. I also check it, because the RBE discord is a great place -- the professors are involved in it, there's alum that are involved in it, [a certain professor] will post pictures of their cats in [one of the channels], and then [other professors] will argue about why putting pineapple on pizza is absolutely abhorrent in unrelated flim flam.

I: Would you say it's more of a professional environment or a social environment?

S: It's definitely a mix. There's dedicated class chats related to 1001, then the 2000s and 3000s, where you can ask questions about this class. Is this homework due tomorrow, or I'm having trouble with part 3b of this homework. They're a little more professional, like you don't post solutions to anything or like that. But then there's other channels that are purely just social, like #unrelated-flim-flam, that's the equivalent of a random channel.

I: Do you think it leans more towards student focus, faculty focus, or a mix of both?

S: It's focused towards students, there's dedicated channels that the professors don't have access to, and the server is moderated by students. The professors kinda just got roped into it, they started using it more because they realized it's a way to easily reach some of their students. I know I've talked with [a professor] at 10 at night in the robotics lab, like "Hey, we can't get this to work." And then they were at home with their family, as they should be at 10 at night. And then because what we were working on was kinda related to the internet at the school, they said, "I'll be there in 10 minutes." And they biked over from their house to the lab and helped us at 10 at night. It wasn't even their class, [a different professor] was teaching the class.

I: Do you think the RBE server would be as successful as it would be if it didn't have professors actively in there?

S: I feel like having the professors there has made it more successful, because now not only is it a social space, it's also a quasi-academic space, to get advice from the professors and to get help in class from the professors.

I: Do you feel supported by your academic advisor, meaning the one that you talked to before your major, and then also your major-specific ones?

S: I reached out to my academic advisor once or twice, you know, they were definitely supportive, they helped me kinda make a rough schedule when I was considering doing a co-op, so taking a semester off or a quarter off, they helped me look into that. At one point, I emailed my faculty advisor, and then never heard back because they were busy. Wasn't critical though, I was just wondering about potentially getting course credit for an internship, and reading around, I think the consensus from other sources was if you're getting paid, you can't get course credit.

I: Are there resources that were created due to COVID policies that you would like to continue seeing used?

S: Submitting assignments online is definitely huge, it just saves paper and saves having to carry a textbook or a bunch of different notebooks. I'm hugely supportive of online submissions, because it also lets you submit other things, like videos, infographics. Recorded lectures, I think is huge, just cause it's not always COVID that gets you down, sometimes it's like "my aunt died and I gotta go back to her funeral back in california," or "I sprained my ankle," or "I broke my leg, and it is challenging to get to class." Things like that should just have recorded lectures. I understand they're not as good as in-person lectures, but in a world where things happen, being able to stay on top of lectures is huge.

I: What resources or support, if any, do you think would help you more as a student? Is there anything WPI can improve on to make you a more successful student?

S: I would have to say, some of the classes that are required have exponentially greater workload than others. You have several classes in a major that are all really workload intensive, so you can't take them at the same time and have good mental health. Sometimes things happen with scheduling, you change your major late, or you NRed a class somewhere, and you get into this position where if [you] want to do this major combination, if [you] want to graduate on time, [you] have to take these challenging classes together, and I don't think someone should be put in a corner like that. Keeping all classes to a fairly uniform, middle-level of workload and difficult would be supportive of that.

I: How has your identity impacted your CS/RBE experience, if at all?

S: I'm one of the lucky few that hasn't felt an impact based on my identity. I remember when I started as a lab assistant, our lab manager, also happens to be new this year, and he looks like an old, old guy, he could be my grandpa, I was very pleasantly surprised that as we were talking, he did ask me what my pronouns were, so that was kinda [cool]. And then he's like, oh yeah, my son is bisexual, and he's getting married to a trans woman, so I was like, let's go! But yeah, I have to say, at least in RBE, not a problem, we're all suffering together, including the professors, so there's no time to be a jerk. There are some students that are kinda jerks, but that's them as students, that's not them as a CS major or an RBE major, they just have jerk personalities or jerk views.

I: Are there any other things that, when you saw "Ooh, I could do an interview", you wanted to talk about?

S: I have to say, not that I can really think of. The big thing is that you know, I started as an RBE major and then later on, started associating with CS majors. There's a very distinct difference between the two, like socially and academically, just kinda highlighting that.

I: What made you decide to [change to being a double major?]

S: Let's see, freshman year, RBE, most of sophomore year, I was RBE. I got an internship after my freshman year, it was technically manufacturing engineering, but basically what I was doing was a little programming internship, working in Python. Even though I didn't know what object-oriented programming was, so I was creating garbage code. It was hot garbage, I didn't have classes. My mentor when I implemented classes was like "ooh, the text is purple now!" High school, my introduction to code was HTML my sophomore year. As you can imagine, I hated it, so most of high school, I never did Girls Who Code, we didn't have FIRST or VEX, so I didn't do those, and then I touched this much Python and a little more Linux my senior year, for my senior year project.

S: I said, okay, I can do robotics, not like a total, a little bit of a bum leg with CS, but whatever. I got the internship, actually showed pretty good talent for it, like my mentor was like, you could do this, with a little bit of instruction, you're actually pretty good at this. And then I took object-oriented B-term of sophomore year, absolutely crushed it. Did I know what Java looked like? No, I live in fear of curly brace languages, but it's all problem-solving, and that's what I really want out of an engineering major, solving problems. At the same time, I was juggling, how am I gonna fit in a co-op in my schedule, because that was part of my dad and I's plan, for me to be able to afford WPI was doing some extra work.

S: Talking with my advisor, it was totally useful to do a spring into summer co-op, or summer into A-term kind of thing. I didn't follow through with it, because a lot of the ones offered were for the whole semester, and I just wanted to take a quarter off to work. It was written down on a piece of paper what my schedule looked like, and there was a ton of empty space, so I was like, what if I try graduating early? But the MQP was the one variable in that, getting a MQP where I could get one credit A-term and two credits B-term was funky. I had a cousin who graduated early, and their advice was "if you're only getting out a semester early, it's not really worth it." I had all this empty space in my schedule, and I still have to fill up half a year with classes. I just started scrolling around, could I do this minor, could I do this minor, and I was like, actually, for a CS major, I just take a bunch of CS classes.

S: I already had met the science requirements and stuff, so I sat down for hours, with Excel spreadsheet, WPI Planner, OSCAR, all the different things to come up with a four year plan, and I was able to mush something together with the two majors together. It wasn't pretty, there were some terms where it's like, you're gonna be busy. Totally looked doable, so I was like okay, I'll go

do it. I dropped ME 1800, which is the machining class that all the RBE majors were like, "you're taking that? Wow, that's so cool!" I dropped that for Discrete Math, with [this notorious CS professor], because I needed the CS credit! It worked out though, because I was taking RBE 2002 at the same time, so it actually gave me a nice light class to balance my schedule.

8.4.5 Appendix H: Nonbinary CyS Student

Interviewer: How would you describe the general atmosphere of the computer science department?

Student: I don't know. I always feel weird with people asking about the community of the computer science Department, because I feel like I'm not very part of it, I guess. I don't know if I show up to a lot of computer science events, I don't know if I know about a lot of computer science events, I'm not gonna lie. I don't know how they aren't making it to me, I guess I don't make too much of an effort to try to find them. I feel like there's an atmosphere of people trying to connect. I don't know if there's necessarily an atmosphere of people getting there, but I feel like a lot of people in a lot of different directions are like, yeah, we should do this, and then it doesn't quite happen.

I: Do you think there are other communities that you would compare to CS? Do you feel more connected with the cybersecurity community?

S: Yeah, I'd say I feel more connected with the cyber community, cause, like, you know, we have CSC and WiCys I can talk to all the time. I have talked a lot more with [cybersecurity professors] than most of the other professors in CS, so yeah, I'd say that. The only [other department community] I know a significant amount of is math, because I have a decent amount of friends in the math department, and it seems like there's a lot of people just hanging out in the math lounge all the time and just chilling, and that's a thing people do. I think that [a friend] described it the other day as, people go to the math lounge to hang out, and people go to the CS lounge to do work.

I: How much collaboration between students have you observed within your CS courses?

S: I'm a very do work on my own person, so this is a little hard to answer. If I can flashback to freshman/sophomore year, the intro classes, people were talking all the time and working with each other all the time. As it gets into higher level classes, I think you've got a lot more people who are like, "I know what I'm doing, Ì'm all set." I know there's the WPI CS Discord that I don't really enter, and it seems like people talk a decent amount in there, and for every class, they have

a channel, I don't know, I don't really go in there, because I'm a bit of the "I know what I'm doing, I'm good" [archetype].

I: Do you feel supported by your professors in Cyber and CS?

S: It depends from professor to professor. I've had wonderful, fantastic professors, like, [professors who] I've never even had a class with, they're fantastic and supportive. [CS professor] is another one that has been super supportive, I had them for 2 classes in COVID, saw them in-person once, and some Zoom meeting for one of the wellness days, [they] DMed me in the Zoom chat, "Hey, I recognise you!" There's been some super supportive professors, some professors that aren't as supportive, [this professor] right now I'm not liking, but I'm almost done. I'd say probably on average, there's not a lot of bad professors, there's a decent amount of mid professors, and then some really good [professors], I don't think there's entirely a lot of bad ones.

I: Do you have a good support network of people that you can rely and talk to about classes, outside of class stuff?

S: Yeah, I'd say so. I've got partners and friends that I can talk to about the course material. If I needed help in a course, I could probably find a friend who could help me with it.

I: Have you received a lot of help/support from your academic advisor/major advisor?

S: Academic advisor, I've talked to a couple of times freshman year. The one given to me by the department, I've never spoken to ever. [My former academic advisor] sent 3 emails to me total, 2 of which were advertising data science stuff, only one of which was about "Hey, if you wanna come talk to me about academic advising, [which was during] my junior year, and then they [took leave], and I got some new random person I've never heard of who has not reached out at all. I will say I have once, when I did want some actual academic advising, I did go to [a CS professor I'm familiar with], and they were super helpful. The one assigned to me by the department, never talked to.

I: Are there any resources that were created due to COVID policies that you'd like to see continue being used?

S: I love and appreciate how much they've been recording classes, and Echo360 [is] my beloved. Fantastic for the days where I can't/don't want to leave my house, and I can still go to class, thank you for that. That's the big one, recording classes and streaming classes has been a godsend.

I: What resources or support, if any, would help you become more successful as like a student?

S: My one thing would be academic advising materials for CS are a little suspect. The course descriptions are way out of date, and especially the prerequisites that are theoretically required, in a lot of cases they're inaccurate. I feel like CS, more than a lot of classes, has people going in the Discord, saying "Actually, you wanna take this course before this one," and "Oh no, you don't need that at all, screw that class, you can just take this [course]". I feel like [this happens] a lot more than other [majors], and that might just be because of the amount of CS majors, but I feel like more than other majors, CS has to course correct in terms of what's actually recommended.

I: Do you think having student input on that would be good?

S: Yes, yes! I think just the professors who are currently teaching the classes should update the course descriptions, because some of them are wildly out of date, but also student input [would be valuable]. I feel like professors know what they're teaching decently well, [but they] don't really know what other classes are teaching, and that's where you need the student input.

I: How has your identity impacted your CS and Cyber experience, if at all?

S: CS, I don't think much. Cyber, especially being a cyber exec member, I think has been a little interesting, because there is the "You are the first woman" label. It was already weird, because, [cyber-related club] used to suck. Then, there was a coup, one of our old exec members just brought in a bunch of his friends to vote for him, and started turning the club around, and it's been getting better and better since then. There were some jokes when I became [an exec member] that "the coup has finally succeeded", which I didn't like, because it implied that I was installed instead of winning on my own merits. I'm not sure it was thought of in that way by the people making those jokes, but it still came across like that. [The previous exec member] and I put a lot of effort into making sure that nobody could accuse either of use of nepotism, {because we were dating}, and I was next [executive board member], so we put a lot of effort into making sure that it was a secure election process, and nobody could accuse anyone of anything. Calling it a coup invalidated a lot of the work we put in. It's affected cyber a bit more. CS, it's interesting, every once in a while, you get the "Oh, I'm the only [assigned female at birth] person in here," you get that every once in a while, it's not always super obvious, but ugh, you get that sometimes.

8.4.6 Appendix I: Female CyS Student

Interviewer: So just to start things out, what class are you in?

Student: I'm in class of 2025.

I: What major are you?

S: Computer Science major.

I: What are your pronouns?

S: I use she/her pronouns.

I: How would you describe the general atmosphere of the computer science department, [in terms of] community, building, faculty, etc.?

S: Faculty-wise, I think they're extremely supportive and pretty helpful. I'm a big fan of the computer science department. In terms of atmosphere, I don't really spend that much time--okay, one of my classes, there's a certain vibe where you can tell who's dominating conversation in terms of who feels more confident in speaking in class, and who also is either putting in more effort or is trying to make themselves seem smarter. There's a certain energy in the class, in most classes, that are about the same. In terms of the buildings, I don't have any qualms with them, I think they're pretty good. I like the way that professors are open to meetings outside of class time, and even outside of schedule office hours.

I: How much collaboration between students do you observe, yourself and other students, forced collaboration versus voluntary collaboration and how has that gone for you?

S: I'd say that there's a lot of collaboration, because obviously there are a lot of projects. In terms of forced collaborations, yes a lot of classes required having a partner or heavily encouraged it, but don't think it was like in a negative way. I think it is better to work with people because it gives you more experience and that kind of thing. I think it is better to work with people because it gives you more experience and that kind of thing. I will say that I have had a few issues with partners, it's been a mixed bag, in terms of communications and that kind of thing. I will say, this one kind of stuck with me because it was a little odd, my first project, I was partnered with this random guy, and he was a little bit. It felt gender-based like in terms of the condescension, where I would get something, or like I would understand something, and [they would] be like, "good job!" We're in the same major, in the same class, working on the same project. But for the most part, I don't have issues with the style of collaboration, I think it's a good thing.

I: Do in general feel supported by professors, specific instances that we can expand on that you felt like super supported?

S: So in general, computer science professors here are good. I don't know if it's just because I was a freshman last year, and there was all the stuff going on where they felt obligated to be more supportive, but even this year, most recently actually, [this professor], I felt very supported by them, because I brought an issue with a partner, and they offered to like work with me every day on the project to make up for the fact that I didn't have a partner. They are very responsive, very flexible, so I felt very supported by that. A lot of my professors have given me the opportunity to take incompletes where I was struggling in the course, or if I have another issue.

I: Do you feel supported by your peers in CS and outside of CS, like you have a network that you can rely on?

S: I have my network of [women in computing club] people, I feel very, very supported. But genuinely, I feel very supported. And outside of CS, not really? But also it's not a necessity for me, cuz my coursework is mainly CS, and the non-CS classes are kinda just, it is what it is.

I: How do you feel about support from your academic advisor/major advisors?

S: I have not spoken with my major advisor ever. Well, I had a class with them, but they weren't my advisor at that point, because my advisor [at the time], [I] also didn't speak to them, but they went on sabbatical for a year.

I: And they didn't give you a new one?

S: They did, my new one was the professor I had before, I just hadn't done it with him. The other advisor that I got when I first came to WPI, they've been pretty helpful, yeah. They helped me with my courses and stuff. I will say that speaking with professors was a lot more helpful, and just like CS students, in terms of planning my coursework, that has been more helpful than speaking to my academic advisor, but outside of CS, I spoke with a few professors in the humanities department, because I want to take a history minor, and they were very supportive, they wanted me to succeed, they wanted me to be able to do what I want with the minor. Even though I never had them in classes, the first time meeting them, they were great.

I: Would you say, as an expansion of that, would a mentorship-type program be something that would've helped you, where you automatically were paired up with someone in the beginning?

S: I don't know, because I don't think that's something I would sign up for. I think that there are a lot of opportunities through other organizations, I don't know if that would've been helpful, but I also knew what I wanted to do from the get-go, I joined WiCys right from the get go, which is a very tight community, and very open, so like, I didn't really need a specific mentorship program, I think that the people who fly solo, or aren't sure what they would do with their degree yet, or just don't really have an understanding of what they want, I think a mentorship program could be helpful? It just wouldn't be for me.

I: Are there any resources that were created or expanded on due to COVID that you would like to continue seeing used, like recorded lectures, for example?

S: I think recorded lectures, I've heard from a bunch of people that professors are still recording their lectures, and I understand that they want to encourage people to go to class, but I also think that it's not fully helpful because I would like the option to revisit lectures and also, if I'm sick, I don't want to be in the room and get other people sick. I also liked the flexibility with testing during COVID, because the flu is still here, and COVID is still here, so.

I: What resources or support, if any, would help you succeed as a student?

S: I think as a student, I think it would be great if there were more MASH-style things, but for CS. Formal CS tutoring hours for big classes, like OS or something like that, that would be great. I feel like when I hear, people who succeed in CS classes often are people who either go to the professor a lot, or they know people who have already taken the class. In terms of WPI as a whole, I feel like WPI's pretty good with their resources in terms of helping students, but I know that a lot of schools have more of a social thing, and I know that they're trying to be more social here, I think putting more energy into that or dedicating more spaces to that that aren't just like little rooms in a res hall where freshmen would go there, but upperclassmen can go there too and just hang out. I think it is difficult to make friends here in some way if you don't make friends from the get go in freshman year.

I: How has your identity impacted your CS experience, if at all, positively or negatively?

S: I think my identity, it hasn't had as big of an impact, and I think it's mainly because I've been in a sheltered circle, where most of the CS people I surround myself with are my friends who are usually either women, or non-binary, some men, but a lot of them are marginalized background as well and are a little bit more understanding. I'm also a part of a lot of "Women in" organizations, like [women in computing organizations], so even if I were to have negative experiences, that would offset it, because I am not putting myself in spaces where I am the minority.

I: Are there any things that you'd like us to discuss as a student in the CS Department?

S: This is not super DEI-related, I just feel like the CS Department, and I'm assuming that they're trying to tackle this, but because there's so many professors that basically drop off of this term or semester, I think it's been a bit, I noticed that a lot of professors are overwhelmed, and it does make it hard to find time to speak with professors, which isn't on them obviously, and clearly they're trying to work on that.

S: I haven't taken social imps, but I heard that it's not super helpful, and it's very surface level. I also heard that someone from the Defense Contractor Company or the professor worked there. But I feel like, the Social Imps class probably is not, I haven't taken it so I can't speak on it, but it's probably not sufficient.

I: There's one other question we were supposed to ask. Are there any Discord communities you felt particularly drawn to, general WPI discord versus the CS WPI one, how you feel about the community there, etc.

S: Personally I am not that much of a Discord user outside of club activities and occasional classes, so I can't really speak on that. I do notice that people do find communities there, and I think that's good, but it's not for me. I'd say that it's great for club resources, and it's very organized, so I like that. But I don't really use it outside an academic context for the most part.

8.4.7 Appendix J: Cyber Security Club Executive Board Member

Interviewer: So just to get an idea, what club are you an executive member of?

Club Leader: Yeah! So I'm an exec member of the Cyber Security Club. Do I need to give a little background of what the Cyber Security Club is?

I: Sure, if you'd like to.

C: Cyber Security Club is a club for people to get together and talk about cybersecurity. We have a bunch of lecture based meetings where club members talk about whatever they want to, and then workshops where we get hands-on experience. We do CTF, we hang out in Discord, I don't know, good and fun.

I: How many people typically attend CSC meetings?

C: I'm not gonna lie, it's been going down recently. We've started to get only 10 to 15, it used to be more like 20 to 30, it's been going down a bit recently, and we're gonna try to get people back in.

I: Is that a trend that you've noticed throughout the year?

C: Last year, it went down over the term. I think this year, it has been going down faster and a bit steeper.

I: Is there anything that you can immediately think of as to why that would be the case?

C: I don't know, we have a few ideas we're going to try, we're going to put out a little form that says "Hey! What could make you show up to these meetings?" I don't know if it's just we're not presenting enough things people are interested in or if it's at a bad time, I've had a suspicion that it's at a bad time, I don't know. Everyone has two billion things to do so far.

I: How much interaction between those club members do you see?

C: Depends on where: in Discord, there's a lot more people active, and a lot more people who interact with each other. People pop into the Discord a few times a day to share a meme or share something new they found out about Cyber Security, and people talk about it. I think the group of people who are active in Discord, and the group of people who show up to GBMs is not necessarily a circle. There's some people that are more active on Discord and some people that aren't active at all, that show up. Just the ones that show up to GBMs, I don't know how active they are with each other. I think that the people who show up to GBMs kinda show up with their group of friends or what not, and kind of stick to that.

I: What made you all choose Discord over other communication methods?

C: The Discord was there before I was even a member. My guess is because literally everything is on Discord, and everything else sucks is my personal opinion. It was made well before I was even a member, so I wouldn't know.

I: When did you first become a member?

C: I first became a member B or C-term of my sophomore year, so some time between 2020 and 2021.

I: Given the declining engagement, are there any other ways that you've tried boosting engagement?

C: I don't know if we've tried a lot. We have things that we want to try, because I think I think part of it is just we are getting less good at setting reminders out and putting things in our Outlook calendar, so that people are like "Oh crap, CSC is in like 6 seconds, I'm busy, I don't need to go." I don't know. We haven't tried much yet, we're just kind of starting to say, "let's get some things back in here."

I: Have you received department funding or advertising opportunities at all?

A bit, we had to reach out to them, but we did receive some funding for WPI CTF this past A-term, we got a bit of funding from them for prizes.

I: How much reach do you think the club outside of club members?

C: I would doubt it. One of the things we're worst at is advertisement, I'm not gonna lie. We do have avenues outside of the club, like WiCyS, and people are active enough in Discord that if we want to post something in [the main WPI Discord] real quick, we can do that. But we are not good at advertising, so I would not be surprised if not a lot of people outside the club know about it too much.

I: What would you consider an indicator for your club being successful?

C: Slightly more members than we have coming to GBMs right now, I was real happy with the 20-30, especially at the start of the term, we can maybe even get to 40, that was fantastic. I also like when people are active in the Discord and talking to each other about whatever. When you see different faces talking in the Discord and not just the same two or three people, that's great.

I: What direction would you like to see the club develop in?

C: More people, better advertisement! If we're talking long term stuff, especially since this is the DEI IQP, more diversity! The club has a bit of a history that we are slowly turning around, but it has a bit of a history. I know a possibly large part of why WiCyS exists is because the CSC used to suck. I am the first non-male [executive board member in high position], I am the first non-male non-secretary exec member. Getting more people who are not white cishet male in, though I don't know how easy that'll be, considering the amount of people in the major who are not cishet males is a little low. It's a problem with computer science, it's a problem with cybersecurity that we don't have enough non-white dudes, so getting more of that would be fantastic. They already have a great space with WiCyS, so.

I: What resources or support would help you be successful in your position as an executive board member?

C: I'm not sure, honestly. I guess if advertising the club was easier, because there are 2 billion different ways to put it up, you know. You put it up on TechSync, you email it out to people, there's like a different way to put a post in every single building, Instagram, all that stuff. I guess if the events office could streamline some of their processes for advertising, that might be a little cool.

I: Do you think that's a thing with all clubs?

I don't know. I feel like part of it is that we haven't done it much before, so it's a bit daunting. It's a process and a half, and it's maybe not worth it for every GBM, but [worth it for] the bigger events.

8.5 Faculty Interview Transcripts

8.5.1 Appendix K: Computing Faculty Member 1

Interviewer: So first question, what courses do you teach, and how long have you been at WPI?

Faculty: I have been at WPI eleven and a half years? I typically teach at the 3000, 4000-level, so [3000-level CS course], [second 3000-level CS course]; at the 4000-level, [4000-level CS course]. I do occasionally do graduate classes, but for whatever reason, not lately. [500-level CS course], is there anything else I've taught recently? I think it is, so there you go.

I: What percentage of students do you see come to office hours typically, and how does that change, like remote vs. in-person, with COVID and stuff?

F: I will say that with office hours, if someone visits office hours once, odds are much higher that they visit multiple times. The people who get past the hurdle of coming to office hours at all seem to make better use of it. As a percentage of the class for my own office hours, I would say that it's probably up to about a quarter of the class. I think, with TAs and SAs, there are some students who will only go to the TAs and SAs, so I might be missing another 5%, maybe 10%. We see commonalities where the person will just visit whoever is offering office hours at that time, so it's definitely a minority in the course, minority percentage of students in the class. I think it's actually gone up since the pandemic started, when office hours were primarily in-person, because what else were we gonna do? At the time, Zoom was not really our radar. A lot of people didn't come largely because the obstacle of like, I guess finding my office and going to the effort of meeting in-person was higher.

F: I will say that it happened more with [3000-level CS course], and I think that class has a bit of a shift where students are going from more of our 2000-level classes, which they seem to excel in, to that course, [which] is a little bit of a wake up call for many, and I think [that] we're feeling a little bit more desperate as a result, and so I would get more people in office hours for that class. Usually the encounters were unhappy ones because they usually came to me fairly late in the process when it wasn't going very well, and so then it's like, how do we recover? The pandemic people seemed to be reaching out a little bit earlier, and it seems to be heading off problems a little bit more than just dealing with tragedy almost. I don't know. That's kind of a rough approximation of what I think I'm seeing.

I: What are common barriers to success, if any, for students in your course?

F: So lately, one of the barriers has been preparation from earlier classes in the sequence. Again, not every instructor teaches a class the same way, some students would come in with really good

preparation in particular, in the C and C++ programming languages, other students didn't seem to get as much out of the courses that were preparation for [3000-level CS course], and so that ended up being a fairly big obstacle. The C programming language, understanding pointers, the idea of casting things and how that relates, that seemed to be a bit of a technical challenge, you know.

F: Another obstacle that seems to plague students, particularly at the 3000-level, is time management skills. I make no secret that I put in checkpoints for my projects. The checkpoints don't amount to much, we don't really grade them, we check to see if they're there, and that's about it. It's designed to be motivational for students to, you know, meet with their project partners earlier than later. When we didn't have those in place, people would miss deadlines 's left and right, and it wouldn't even be close, it would be many days behind. When we put the checkpoints in place, we still have people who have a little bit of trouble with the deadlines. It doesn't seem quite as much, but we do have for whatever reason a bit of a culture of procrastination, and it doesn't work out.

I: So one specific issue we're looking at in general is collaboration issues, so issues with project partners, time management stuff with that -- how noticeable has that been in courses that you've taught or some of your advised students?

F: I will tell you that one of the statements that I heard from my provost, one of the ways that they'll talk to prospective students and parents is they will say, "you know, one of the great things about WPI is that students will work in teams, and certainly by the time they leave WPI, they will know what an ineffective team looks like," and so we're definitely providing people training opportunities to see when team arrangements go poorly. That is perhaps a good life skill in and of itself. I hope that as part of the process, we're also showing people what it looks like when teams go well, and how to maybe take a mediocre team and turn it into one that is pretty effective, hopefully that comes along the way.

F: I think in our Software Engineering class, there's a little bit more focus on making that work right, particularly because the teams get larger; in the classes I teach, it's mostly just an assumption that you know, you'll end up with a project partner, usually it's only one, for the 4000-level classes, sometimes we go up to teams of 3. I have found in my classes, if the team size is larger than 3, accountability becomes a problem, and so not all of the team members seem to contribute as much. When it's pairs, that seems to work out a lot better. 3 usually is good, though there are some teams that end up with one person who under-contributes and two people who really carry it. We see less of that the smaller the team is, and so I typically like pairs for projects.

F: I have found that as an instructor, the more I get involved in team dynamics, the worse it is for everybody, so I try to stay out of the team assignment process in general, I try to have software that lets them take their teammates if they want. I have software so that they can randomly be assigned a project partner, but it's not really random, it's a queue, and so people who sign up earlier are paired up with people who sign up earlier, people who are procrastinators end up paired with procrastinators, so the hope is that the project team ends up fairly similar in composition. You don't want somebody who's a procrastinator tied up with somebody who does everything earlier, because then the procrastinator is like wait, the project is done, and they haven't even started yet, I think that wasn't fair, and the other person has very strong opinions on the other side, so you kind of want to balance that.

F: You also want teams with skill sets that match a little bit. I would much rather [have] people who are a little shaky on their preparation be paired together, rather than to pair those people with two people who are very feeling very strong about their backgrounds, that kind of pairing works poorly. The person who has a bit of a shakier background never strengthens it, and the person who has the strong background feels like they're carrying the person, so the best team seems to be teams with similar backgrounds being matched together.

F: We have partner evaluations for each of the project partners and pairings that I set up, that usually is just people identifying when things have gone horribly bad. There is some accountability, we ask people "what did you do, what did your project partner do," so there's some kind of record to keep it plausible, but usually we identify, yeah, that team kind of exploded, they won't work together in future, they get paired with other people, and we go from there. What are the difficulties with the partner evaluations? Sometimes students will fill out their partner evaluations and cover for their project partner, who hasn't really done much, and then I have no recourse to be able to figure out what's going wrong there. I don't think that's particularly helpful to anybody, when a project's team does implode, and one of the teammates didn't do anything, and they let me know they didn't do anything, we can do incompletes and have them make up the project later, and they'll actually learn something from the class, but when it's covered up, they just skate by, and so under their next course, [they don't know] what they're doing.

F: In computer science, it feels like we have to teach people how to work in teams, because that's what the job is gonna be when they're done, but it's rough, and I think many people will come out of WPI's CS program going, oh, some bad teams are really bad, good teams work like a dream, but man, there are a lot of bad teams out there.

F: When I was a student, I was on a team where they just had background in a particular Java Swing. They had prior backgrounds of Java Swing, and we were using as part of one of the things that we were building, and I'm going, I know Java, never done anything with user

interfaces before, and they're like, and it was done, and I'm going, I didn't get anything out of that! And so I got to be everyone's favorite project team member, the documentation person, but I wanted to build things too! So I mean, I've been there, and I think it's useful for each person to be the strong member of the team that feels like, you know, where's everybody else on this project, and to end up being the person that's like, I guess I'm not doing as much as I should have that way. When they interact with other people, they can kind of empathize with the different roles a little bit easier, but I mean, that is a very hard thing to make happen. Do lots of teams across lots of classes and hope that those experience come to be.

I: We were wondering if there were any resources or support that would help you be more successful in your position, since we're giving recommendations to the CS Department, we also want to take the professor's perspective into account on that.

F: One of the things that, and I know that I will be a consumer of this recommendation as well, but just as a faculty, there is a lot to running a course that is not the instruction part, right? It is the logistics of managing teaching assistance, you know, checking in with teams and seeing what's going on there. I think that for many courses, we are under-resourced on the assistance that we have, and we end up using technology as a crutch. I mean, it's no secret -- I developed [grading software] because I was not able to run my courses effectively without it. At the time we had Blackboard, that was awful software. And Canvas, I think is good. I mean, if we had Canvas when I started, I probably would never have built [grading software].

F: We rely on software to kind of do some things that maybe a human should be a little bit more involved in, but I mean, that feels like such a luxury that I don't know that we'll ever come back to, automated grading and things like that, that's what people are talking about more, is how to make automated grading still a good experience for the students, still something that lets you evolve -- it's very easy to create a single assignment, and setting up auto grading for it, and then to never change the assignment and find out it's on GitHub for like 20 years. So that's no good. Being able to continue evolving projects to keep things current is a bit of a challenge. It's just time pressures and all that.

I: As a faculty member, how do you describe the sense of community, especially relating to DEI, how groups of students interact with each other, and also faculty as well, if you're on that side?

F: One of the things that struck me when I came to WPI was that when I announced [major life event], everyone was supportive. I moved here from [southern state], that is not the reaction I would've gotten, so I was pleased by that. I think that particular aspect, our department has experience with, and we're getting pretty good at that. I think other elements of the LGBT community, we're learning, and it's taking a bit of time. Particularly with support for transgender, intersex, non-binary individuals, I mean, we just recently had an all-gender restroom in Fuller,

and I mean, we're dealing with people just not being accepting of that or not really understanding what that is or why it's important. I think we'll get there.

F: Part of it is that a university is reflective of the society it is in, and our society isn't quite there. I think our department in our university is doing better than many, but we've got work to do there. When we think about gender diversity and racial representation in our department, we have a long way to go. We are trying on the gender side, and I think that there has been substantial progress there. I imagine that we still have instances of microaggressions that we aren't recognising, and on the racial side, we are hearing reports, and I don't know if this is related to the department in particular, but for the student experience at WPI-wide, our students of color are reporting that if they travel at night on the WPI campus, sometimes they have run-ins with law enforcement, not thinking they belong. That is a horrible message to be sending. Our students, sometimes, have backgrounds where they are not realizing that they're being completely and utterly racially insensitive with remarks, not even realizing that they're doing it.

F: I think our faculty in general tend to be of a political mindset that ends up being more towards the accepting end of the spectrum. At the same time, faculty are multi-generational, and what was super accepting at one point in time is now just kind of in the middle, or maybe not as far as it needs to be. I think people mean well, I've noticed that in the faculty that people seem genuinely interested in doing the right thing. I think that the vast majority of our students are in the same spot, but I think that there is some implicit stuff that people don't even realize they're doing.

8.5.2 Appendix L: Computing Faculty Member 2

Interviewer: What courses do you teach?

Faculty: I teach mostly [non-coding] classes. A few design and a couple of tech classes are on my radar [as well]. I teach a [scripting] course, using direct content creation software, so Autodesk, Maya, so that's to teach people how to code. And after that we remodeling the environment modeling and a lot of things have to do with the unreal engine, so I've begun to teach scripting in that as well.

I: How long have you been at WPI?

F: I think at the end of this year, it'll be 7 years.

I: What percentage of students usually come to your office hours?

F: 2%?

I: What do you think the breakdown of that is like, like what kind of students usually attend office hours?

C: When I think about it in terms of office hours, not general students coming in to see if they can get into a course or something like that, it's usually the students who have taken the opportunity to build a relationship with me as I left that door open. I would say that's really it, it tends to be the students who excel. The ones who build relationships with the professor, or people who I'm like, you're having problems, let's sit and talk. For the most part, the rest of the students, they don't bother showing up. I think one thing that I do differently as well is even pre-pandemic, I had office hours based on any time I was actually up and available. On Slack, I would have some at like 12 on a Friday night, saying I'm struggling or I need help with something, and I'm like "Well, I'm actually available, and I have the mental capacity for this." Those would be like office hours, so I do things like that a lot. To keep myself available more online and over the phone, if not in-person.

I: How do you think office hours have felt compared to like, being remote, when we had the whole pandemic?

F: I feel like before academia, this institution, and even students in general, acted like online didn't exist unless it was like YouTube or TikTok. It became much easier to say, "I'm not on-campus that day, let's set up a Zoom", "let's meet over Zoom if we can't meet in-person." It's been easier for students to even then say, "I have to work while I'm at school, so my hours aren't that great, are you available on Zoom?" It helps me be able to work a little bit more in their schedule, and I think they expect it a little bit more, and it's also been good on my side where it allows me a lot more freedom to conduct my own research off-campus where I tend to work better. I think those two came together really well. It's still kind of like the same stuff to pre-pandemic, but I think more students are open to it. Basically, COVID made everyone an expert in setting up video meetings.

I: What are some common barriers to success for students in your courses?

F: Students' time management is one of the big ones, understanding that pretty much every course is a lot of work, so not going in there with like a coursework bias. I think that one of the things that I've been doing a lot is trying to figure out ways to add more repetition. More repetition and setting clear boundaries on when things are able to move forward. I don't discuss grades anymore in my course. If you do the midterm, you get a B. If you do the final, you have a possibility of getting an A. All work not including midterm work earns you a C. I use a lot of tutorials instead of books to keep prices down, because I started teaching at for-profit institutions that were robbing students of their money, and I wasn't about that life, so I told them don't buy

any books. Then I worked at a community college and a state school, so I'm really big on not giving publishers money for no reason. I also think that is one where things change so rapidly. That book today is completely useless in like 4 months, or like half the material is useless, so it doesn't make sense to do things that way.

F: I think, with my new clear guideline, it's to get a C. If you get a C, you can move on to the next course, like this is the bare minimum. So I have points where you pass this threshold, that's your minimum. So if you need to concentrate on another class that is stressful, you know you have a C in this class. You know that's what it is, and then you know likewise what it'd be like to get a B. It is similar to an ungrading model, but with like, clear guidelines for people to hit so that they can gauge their own growth.

I: With outlining these expectations, do you think it benefitted?

F: I know for a fact that in one of my courses, half the students got a B, and then I haven't seen them since. The other half who enjoy the class, and they wanna get an A, and some of the students who have earned the B who have basically said, some of their other courses are just really intensive, it's killing them, did they do enough to get the B? They don't trust me, more or less. And I'm like, yes, you did it, was just like i'm so sorry I actually really enjoyed this, but if I know I have a B here, and I have a C in another class, it makes more sense to get two Bs, and then they got a B, so they're ready for the next course. That's what the repetition is at the very beginning. It's repeat, it's a process.

F: What that also does is allow for critique and feedback for them to improve. This is one of the reasons why the need permission to do the midterm, because if the work isn't up to par, you're not doing the midterm, because the midterm is automatically, you get a B for completing, but if you don't do well on the midterm, which some people are taking the midterm week 5 or week6, you can't move onto the final. So this way, feed them the goalpost, and they know where they are, and found that it destresses the class. This also lets people who have to work outside the school day, they know where they stand, and it's not going to change. It's not like I have an A in this class at this point, and then I fail these two tests, so now I'm at a C, no, you earned this, that's your minimum.

I: How often do you have collab work with students, where they had to pair up, or in groups for projects, etc.?

F: I would say very rarely. It's something that I have had a lot of trouble with before in the past. I guess my philosophy here is, let students stand on their own, so that their peers get to see the level of work they're doing. And then, later on, in something like an MQP or the really group-focused stuff, when students are complaining about a student or something, I would

usually see it coming because that person hasn't worked in my class and I know what their work ethic is like, so they can't hide within a group. One thing it has done is, I've had people who really want to rail against someone in a group, and I'm like, this is your strongest worker. I was able to talk to that student, and they were just going through something, things were going to be sorted, and sure enough, they were back on top of everything within a term. With everyone understanding that, and giving them a more appropriate role, it just helped everything out. I tried to create my exercises and material on individual things that students can do.

I: How would you define diversity, equity and inclusion?

F: I think that for me, what it means is meeting people where they are, trying to have some understanding of what can possibly getting in their way. Getting a feel for how they're doing overall, and lifting them up to higher levels of achievement.

I: Then with respect to that, can you describe the faculty culture in relation to DEI then?

F: I don't think half the faculty cares. That's my overall opinion, I don't think half the faculty cares, I think some of them are the problem. I know that there are a lot of people who care, but at the end of the day, most of everything I'm looking at it is based on feedback I'm getting from my projects. I think one of the things that I see now is for many people, DEI means LGBTQ+, and that is starting to become a major point in contention. Not on campus, but in the greater conversation with DEI, and it's really tough to navigate, because it always starts to seem like pitting one group against the other, when it's really like, no, we're trying to point out hypocrisy.

F: One of the things I've been working on is understanding the best way to talk about the Kanye West situation. I had him canceled years ago. I was already there. Even after I had canceled him, he then said slavery was a choice, and then Adidas signs him to a contract for sneakers, which we find out he's been making two million an year. And then he says he's going DEFCON 5 on the Jews? And then Adidas is like, this doesn't match our cultural beliefs, and so they cut him off, and he lost over a billion dollars, where it was like… I'm sorry? I don't know what else he said, I didn't get a chance to go into it more, but if I said I'm willing to DEFCON whatever on somebody, I could understand how that's problematic, but I didn't say anything yet, I didn't pay attention to that yet. But "slavery was a choice" is already so ridiculously offensive, that's like being a holocaust denier. So why was that acceptable and you could sign him to a billion dollar contract, and on this one, no, he's wrong, and he's a horrible person, so we're gonna cut him off? I totally agree that he's wrong, that's why you shouldn't have signed him in the first place. A lot of that, I think is also at WPI as well, where it's a tough conversation for a school that has been predominantly white males, like up to even eight years ago.

F: I'll also say that the former head of CS looked for the whitest people to hire. I'll throw that out there. That to me was the biggest red flag, which was, WPI lost out on many published articles and chances to get some really great scholars who are looking at AI, who programs the computer and why computers are racist? Computers aren't racist, they're programmed to be racist, and with bias, things like that. WPI has not been part of that conversation at all. And it makes no sense, until you realize that it has not been a priority.

I: How are some of the ways you've tried to promote DEI in your classes for example?

F: I directly call people out. I've come to the point where I'm just tired of trying to be political, be nice. I see it, I call it, that's where it's at. I do that with students, I do that with faculty. I guess a part of me stopped caring. I honestly feel like that's a voice that's been missing -- I don't think everyone should be like that, I think that we need the more calmer voices, the people who will help, the people who are called out, lick their wounds and tell them what they do wrong, but I also feel like you just need people who will start to call it out more. I completely advocate for diversity when I try to be on every hiring committee I can be on, and within the class itself, I try to find experts, so experts from a psychographic. In some cases, I can't find women or a lot of people of color doing something, because YouTube algorithms, they're just not popular, but what I do try to do is people whose work has been shown, who are promoting diversity, even if they meet the demographic norm. It's really the psychographics I'm more concerned with.

I: How would you describe the general CS community? And if you feel like you're not totally equipped to answer that, you can also talk about the [non-CS computing department] community.

F: I guess I can approach this with kind of the way I see, cuz I do know the [non-CS computing department] side better. I guess the best way to answer this is in [non-CS computing department], we changed a lot of faculty this year. Through people leaving, and deaths, and the people we brought on where we pay attention to the psychographics, a lot more interesting conversations are happening about DEI and what it means in storytelling. We are all challenging each other with our thoughts, and that's actually made us more collegial. We were very collegial with the people who were here before, but I do think that we did replace 2 older white males, who, I will say, definitely weren't racists, but there's no way they didn't have some sort of bias, because bias comes from the media we take in, and if you grew up in the fifties and sixties, there's only so much you could have done to avoid getting that bias.

F: And so we have a group that is actively fighting against that bias, or talking and thinking about it differently, and actually continuing the work that the people left us, the work that they're doing. But they're more sure in what they're doing, so they speak more confidently. The way they're able to assert themselves, it carries over and just seems more impactful and meaningful, because they are asking questions, but they are also being assertive with the questions they're

asking. I think that for me, that's something that the CS, with all the hires recently, since it wasn't paying attention to that, those are the conversations that it's not having, or not as much as [non-CS computing department] is having.

I: Do you think people are being more vocal? I know you mentioned assertive, I'm just trying to get a full picture.

F: I think as things come up, there are going to be people who are more comfortable being vocal, but I also think that's in the conversation that gets generated outside the classroom ends up changing what people are doing inside the classroom. I also feel like because we all know this is something we care about, we're able to butt heads a little more to talk about those intersectional controversies. I think a lot of us are okay now saying, "I don't get it." I feel like for a while, that was something that was a death sentence, I don't get it, and it's like, you're not an ally, whereas now it's like, I don't get it, I want to get it, but I really don't understand this. It's very different now, because you have people who are like, I will help you get it, we will figure out how to communicate better.

I: Is there anything else you in particular want to talk about with regards to everything?

F: I think that DEI is stuff that I am working on, but more in terms of "How do we make it so that everyone understand that it's for everyone's benefit?" The easiest way I could put it is, and I've really sat down and thought about this, but in terms of like full movie experiences, I'm gonna say Black Panther steps out of being a comic book movie in many ways, because it's dealing with greater social issues, and it's a commercial success, and why would any student not want to be a part of something like that? There's a benefit there. There's stories there that haven't been told, and they're interesting, and it's how we learn, and it's how we embrace and improve our culture.

F: I think for me, I'm very different where I'm not telling students to do this because it's the right thing to do, I say do this because this is a career path you've chosen, and you need to think about these things. There's going to be a time where if you're not thinking about them, you're just not going to be hired, because you're going to be seen as one of the people who makes headlines when we look at what toxic thing happened at Microsoft and Blizzard and stuff like that. So if you're not on board now, people are just gonna say, we got rid of all the toxic people ten years ago, there's no way we're gonna promote someone we hire today 15 years from now to become the next toxic person. I just don't see companies doing that.

8.5.3 Appendix M: Computing Faculty Member 3

Interviewer: What courses do you teach and how long have you been at WPI?

Faculty: Okay, okay, great. Yes. So I have just joined WPI and I'm teaching a [graduate course]. And that course runs through the entire semester, the entire fall. I've taught this course before in [this country].

I: So as a grad professor, it's a little bit different, but like, what percentage of students do you see come to office hours in general, like a percentage of your class, I guess?

F: Yes, yes. I'm trying to remember the students; there's students that come like every other office hours that I hold. Some of them, I guess, came more in the beginning of the course. And many of them came to discuss some of the projects that they're doing for the course. Some of them have never come, neither to the in-person [nor] the [online] office hours. And I tell them to come [during] every class. Yeah, I'd say like 36 students. Maybe like 12 of them have come at least once to office hours. I would say that five of them [have] gone somewhat often, and maybe two or three of them come very, very often. Maybe one thing that I would say that reduces the interest of coming to office hours is the fact that I'm really present in the Discord server for the class. [I] answer your questions all the time, even on weekends, so maybe there's less of an incentive for them to come in person [because] they can ask questions all the time.

I: So because you're on Discord, and you're already there, they don't really need to come in person for office hours. And would you say so I know you mentioned having online and in person office hours like we do students tend to come to like one type of office hour over the other. Do students come online or in person more?

F: [They] definitely come in person more. So I don't know if that has to do with the timing. Because, the in-person is on Tuesdays, and the other one is on Fridays? Yeah, I don't know. Also, sort of different hours. One of the students told me that they always forget about the office hours. They are doing this other thing on Friday, and then they forget that I'm online to answer questions. So yeah, definitely the in-person time slot is more used than the other one.

I: What are common barriers to success for students in your course?

F: Good question, I think the course doesn't have any formal requirements, right? But the syllabus also does mention that they need to have some background in linear algebra and probability and statistics in general. Some of the students [that] were interested in taking that class, they have come to me to make sure they had the necessary background, right? Some of them maybe haven't seen this, and they told me afterwards after like a few lectures that they were

having some trouble following the math in the course, right. It definitely requires a little bit of a math background and also some programming background, and they need to have some programming experience to do this. I have a student that is a PhD in physics that was really struggling in the beginning, but because we're doing the assignments in groups of two or three students, [they were] able to group a team with another student, I don't know if it's Computer Science, I think it's a Data Science major. They're doing really well because the physics student is really good at math, and the other is really good [at] programming, so they're learning with each other. It's not like I'm just doing this thing and then you're just doing that thing. So definitely, if you don't have all the background, you should try to team up with someone that has the complementary background so that things can work out. Otherwise, you could definitely have a hard time.

F: If I can mention maybe one other thing that people have struggled with–we have students team up to do paper presentations and to do the course projects, and I think some of them do not really know each other. They will come to me and say, "oh, I need a group and I don't know anyone, so can you help me find a group?" And one thing that has worked is to just like, send messages on Discord. I would send a message: "so we have this student that is interested in working on these topics. Is there anyone that is willing to team up with [them] to do the group project?" I guess if the students actually come to me and talk this through, then we can work it out, but there might be students that I'm not aware of [who are] facing these problems.

I: So I know you talked a little bit about collaboration, but have you seen any specific like collaboration issues outside of like finding partners, but just like any issues while people are in teams or stuff like that?

F: Not in my class. [They do exist] in my MQPs that I'm advising, but not in my class. I think the groups of students that know each other, they're doing pretty well in terms of assigning tasks and sort of distributing the project load. I'm not totally aware of how the groups that don't know each other are working out together, so that's maybe just the fact that I don't know. It doesn't mean that [issues aren’t happening], just kind of [happening unbeknownst to me].

I: How would you describe the faculty culture in terms of DEI as a faculty member?

F: I think there is a very, very strong awareness of the issues in [the department], that the department is really invested in having a committee to develop to work on all of these initiatives to I guess, not only improve awareness, but try to address conflict and sort of try to do more of the things that we're doing right and figure out what can be improved. The other thing I should mention is that whenever there is faculty hiring, they really take into account diversity issues- they want the faculty body to be representative for the students that are taking our classes that are coming to WPI. So I can definitely tell [that] this is a strong trait in [the computing] department.

So yeah, I think we have a very good diverse faculty body, and I don't know of anyone who is not onboard in addressing those issues.

I: And would you say that's the same thing with like [department] as well, where the [computing] department seems to be super focused on DEI issues as well.

F: We also have a DEI committee and because we're like a program and definitely there's less faculty in the program in [larger computing] department, I feel like there is less- so the committee is definitely smaller here; we have two people, it's me and another professor, another faculty, and they're, I think it's four. There is the amount of things that we can do, the changes that we can work on is definitely smaller. I think [this DEI Committee member] is really, really invested. They really think this is a very, very important matter and make it very clear in the meetings where we were discussing those issues. And it's just a pity that we don't have more people to kind of work on other things.

I: In terms of recommendations, would you think having like students support maybe in like, either the data science or the computer science committee would help you succeed a little bit more and just getting things that you want to get done? Or would that be like, too much of a distraction? Like having to manage students and stuff?

F: Not at all, I think it would be great. There are things that are, I feel like it's definitely easier for students to do like, reaching out to other students. This is a big thing- as I started doing interviews with the organizations, I figured so thinking, it'd be great to have an IQP to do this! So I feel like if we could have students involved in these initiatives in these committees, that will be definitely a great thing. There's other things they can do better than us.

I: What resources or support if any, would help you be successful in your position? I know we talked about having a student council, but just as a faculty member, an MQP advisor, [and] as a DEI committee member?

F: I never thought about this. Like, I just assumed like, “Okay, so they're giving me the resources that I need and I just have to figure out how to do things with that.” I don't know. I don't feel like I have a good answer right now. And it's like, the general answer would be you need students to work with me to do research and to teach the students and that's sort of, as part of like my faculty hat in the DEI [Committee].

I: We are also wondering like, just in general, how would you like, describe the general Computer Science community?

F: It's hard to tell, I just got here and I didn't have much contact with the undergrad students- I have not taught an undergrad course. I love the fact that they are starting the mentoring program for new CS majors. I think this is a great thing. I feel like the Computer Science faculty are very supportive to each other. And they really try to bring the community together in organizing events. So just yesterday, we had a CS holiday party for faculty and staff. Yeah, everything was here in Unity Hall with like, we had a potluck party. And I think this is great. So far, I definitely have more contact with the [home program] graduate students taking my course right now. To be fully honest, I don't know exactly who is [home program] and who is [computing department] and who is [other computing department], so it's hard for me at this point to say more than that.

I: If you like, I'll ask the same question about the [home program] community but like, is it the same kind of answer, that like you're kind of new, but like seems generally pretty good?

F: Yes. That's definitely how I feel.