
UNIVERSITY OF ILLINOIS DEPARTMENT OF COMPUTER SCIENCE CULTURE SURVEY

A PREPRINT

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February 22, 2019

ABSTRACT

Just over 10 years ago, we conducted a culture study of the Computer Science Department at the flagship University of Illinois at Urbana-Champaign, one of the top five computing departments in the country. The study found that while the department placed an emphasis on research, it did so in a way that, in conjunction with a lack of communication and transparency, devalued teaching and mentoring, and negatively impacted the professional development, education, and sense of belonging of the students. As one part of a multi-phase case study spanning over a decade, this report presents findings from our 2017 culture study at the university. Our data reveals improvements in the perceptions of undergraduate teaching quality. However, among faculty, undergraduate students, and graduate students, we also found evidence of continuing feelings of isolation, lack of mentoring support, incidents of bias, policy opacity, and uneven policy implementation that are areas of concern, particularly with respect to historically underrepresented groups. We discuss our findings and offer recommendations to the department on ways they can further their efforts to create positive cultural change in computing.

1 Introduction

For over half a century, the recruitment and retention of women and people from historically underrepresented minority backgrounds has remained a problem in computing. While some scientific fields, such as the life sciences, have seen great improvement in degree participation by women and people of color, computer science and engineering have experienced declining occupational and degree participation by women and people of color, with enrollment and employment trends by these groups in 2013 nearing where they were in the 1960s [19].

This gap is particularly problematic with respect to the shift in the college-going population in the past 50 years [3]. The number of bachelor's degrees awarded annually has more than tripled since the 1960s. The proportion of women earning bachelor's degrees has grown from 43% to 57% in 2013; in 2013, women earned 50.3% of science and engineering bachelor's degrees [6]. Yet, that same year, women earned only 18% of bachelor's degrees and underrepresented minority students earned 17% of bachelor's degrees in computer science. In looking at all of the bachelor's degrees earned by gender, in the 1960s men were earning Computer Science degrees at three times the rate of women, while by 2012, men were earning Computer Science degrees at six times the rate of women. At the graduate level, these figures show similar disparity, with women earning roughly 34% of master's degrees and 22% of doctoral degrees in 2013. For underrepresented students of color, these figures are 11% and 5% respectively.

Looking beyond degree attainment, other work shows gaps in the workforce. Proportions vary broadly by field, but the computer and information science, and engineering workforces see the smallest proportions of women at 24% and

15% respectively [6]. In 2014, Google publicly disclosed that 17% of its tech workers were women, 3% were Hispanic and 2% were black [20]. That same year, Facebook, LinkedIn, and Yahoo also publicly released employee diversity reports, with similar demographics. On the academic side, in 2010, only 4% of full-time Computer Science faculty were members of underrepresented minority groups [32]. In 2013, their numbers had risen to 6% [6].

Much research explains such gaps by pointing to cultural barriers and biases faced by women and people from racially marginalized backgrounds. These barriers and biases influence sense of scientific identity, self-efficacy, and fit [35, 8, 30]. They are also largely responsible for the stratification and inequities related to a complex landscape of professional experiences: hiring, space and resource allocation, salary and compensation package composition, evaluation, recognition and awards, research grant funding, promotion, tenure, access to key professional networks and mentors, movement into leadership roles, access to funding and knowledge resources necessary for scientific commercialization, and more, [4, 5, 19, 30, 22, 25, 28, 14, 13, 18]. These issues do not just have a negative impact on marginalized groups, but create problematic environments for all members of the computing community and undermine our meritocratic goals.

Research and practice have focused primarily on the recruitment side of the picture, aiming to draw more women and people of color into STEM by “fixing” their interests, self-confidence, and self-efficacy and providing them with tools they can use to survive within the existing culture, ([15, 28, 26, 23]). While this approach can be immensely useful as a support system, it does not address root systemic causes necessitating survival mechanisms in the first place. Survival mechanisms alone cannot and have not resolved the structural and systemic issues pervasive within STEM educational and work spaces. This study joins in the research efforts dedicated to understanding and addressing the cultural and experiential issues impacting retention, especially for members of historically marginalized in STEM and in computing disciplines where retention issues are growing.

Most recently, universities around the country, including the University of Illinois at Urbana-Champaign, reported record-breaking numbers of freshman women entering Computer Science programs ([34, 21, 40]). We are excited to see this influx of women due to recruiting and outreach efforts. But we and the department at Illinois want to make sure that the underlying cultural barriers and biases are addressed in ways that facilitate the success of *all* students and faculty within the department rather than seeing a mass exodus down the road. This study contributes to over a decade of efforts to create a departmental culture at Illinois that fosters a sense of belonging, collegiality, innovation, and well-being for all members of the community.

2 Background

From January to July 2006, we conducted a two-phase study to evaluate undergraduate and graduate student attitudes about and experiences in areas contributing to enrollment and persistence: recruitment, retention, and preparation. We began with a pilot study, interviewing eleven participants who were deliberately picked for their collective breadth of experience and demographic characteristics. These hour-long interviews uncovered qualitative trends and helped to refine the survey questionnaire. In the second phase, we offered online questionnaires; the 119 participants comprised 61 undergraduate students, and 58 graduate students. Overall, the survey participants were 17% women and 83% men, at a time when the department was 14% women and 86% men.

By the end of our work, we presented the department with a collection of policy and practical recommendations. Published in a white paper to the department ([11]), a 2008 article ([9]) and in Metcalf’s second master’s thesis ([27]), these recommendations encouraged more interactions among community members, greater flexibility in programs of study, and more opportunities for quality outreach, teaching, and mentoring that can also assist in the department’s research orientation and goals. The eight recommendations were:

1. Provide more comprehensive information to prospective graduate students.
2. Facilitate more opportunities for outreach.
3. Facilitate more interaction between students and faculty.
4. Improve quality of teaching.
5. Provide more flexibility in core requirements.
6. Increase early research opportunities.
7. Create multiple and diverse mentoring opportunities.
8. Provide an adequate family leave policy.

In the years since the original 2006 study, through the bold involvement and advocacy from several key faculty members, the department has revised its curricula, advising policies and practices, and outreach efforts. Quoting a letter of support from the Computer Science Department Head [36], the specific changes informed by our study included:

1. A smaller and more flexible undergraduate core curriculum.
2. A more flexible graduate core curriculum, which again attracts students with more diverse backgrounds and interests, and which allows Ph.D. students to start research more quickly.
3. Annual progress reviews for all Ph.D. students, which have improved communication between students, advisors, and other faculty mentors.
4. Changes in graduate admissions procedures which broaden the set of potential advisors for all incoming students.
5. A formal teaching requirement for all Ph.D. students.
6. Significant improvements in undergraduate advising policies, including an assigned Faculty Mentor to every undergraduate as well as two full time student-facing academic professionals.
7. Investment in formalized teaching track faculty.

While the department instituted a number of changes, many were met with resistance. During a 2006 presentation of the findings, several faculty members expressed disbelief even in the face of statistically significant evidence. We experienced a particularly poignant moment during one presentation to the faculty. While discussing a participant's quote on a lack of mentors, one faculty member said, "*Your work is very interesting, but this kind of thing doesn't happen in my research group.*" We had interviewed two of his students, one of whom said the exact quote to which he objected. We knew that "*kind of thing*" happened in his group, and that his own students were lamenting a lack of research mentors. We report only one among many of our own experiences here, but this pattern of resistance despite empirical evidence is seen in the research on bias, discrimination, and exclusionary behaviors. Regardless of gender, this research shows that people have relative reluctance, particularly those who are faculty in STEM departments, to accept evidence of biases in their field, [7, 17, 38, 39].

In 2015, the department's Associate Department Head reached out to our team to conduct a follow-up study to gain a renewed sense of the current state of the departmental culture. Over 10 years later, the demographics have shifted. As shown in Figure 1, between Fall 2005 and Fall 2017, the total Department of Computer Science undergraduate population more than doubled from 785 to 1805 students (1337 men, 463 women, 470 white, 30 African American, 656 Asian American, 77 Hispanic, 48 Multiracial, 504 international, and 19 "unknown"). As shown in Figure 2, at the graduate level, the department increased from 411 students in 2005 to 646 students in 2017 (509 men, 137 women, 106 white, 6 African American, 72 Asian American, 19 Hispanic, 4 Multiracial, 427 international, and 11 "unknown").

Though faculty were not studied in our original survey, we have included faculty in the 2017 study. As such, it is interesting to observe how the faculty demographics have shifted since 2005. Today, as shown in Figure 3, among both tenure-track faculty and other instructional staff, the percentage of men is over 80%.

3 Methodology

We conducted this follow-up study in two-phases during Spring 2016 - Fall 2017 at the University of Illinois Department of Computer Science under Institutional Review Board project 16507. In the pilot phase, we updated and tested our three survey instruments and interview protocols (one of each for undergraduate students, graduate students, and faculty members) via 60 to 90 minute sessions with participants. Our preliminary findings from the pilot study with undergraduates and graduate students are available in [10]. We have also published initial findings from the undergraduate component of the study, available in [29].

We then revised the instruments according to pilot feedback and launched the on-line survey, inviting the entire enrolled undergraduate and graduate student populations and current faculty members to participate via e-mail from representatives of the department's academic office and the department chair. Except for two questions necessary for consent, no question on the survey was required; participants were allowed to skip questions.

For the Spring 2017 study, survey questions covered a variety of topics about experiences in the department. For undergraduates, this included: their pathway to the department, coursework and attendance, quality of teaching and instruction, advising needs and experiences, mentoring, sources of support, sense of fit and belonging, extracurricular activities and free time, departmental values and culture, future plans, and demographics. Graduate students also answered questions about assistantships, work-life policies, and the qualifying exams. Faculty members were queried about their pathway to the department, performance evaluations, workload, teaching, mentoring, service, work-life

	Undergraduate Population		Survey Participants	
	2005-2006	2017-2018	Spring 2017	
Total	785	1805	339	222 ¹
Men	90.7%	74.1%	39.8%	60.8%
Women	8.9%	25.6%	24.8%	37.8%
Gender Minorities ²	n/a	n/a	0.9%	1.4%
White	63.8%	26.0%	27.4%	41.9%
African American	1.6%	1.7%	0.3%	0.5%
Asian American	20.4%	36.3%	32.4%	49.5%
Hispanic	4.5%	4.3%	0.6%	0.9%
Native American	n/a ³	n/a ³	0.3%	0.5%
Multiracial	n/a ⁴	2.6%	4.1%	6.3%
International	7.6%	27.9%	17.1%	26.1%
Unknown	1.5%	1.0%	34.5%	n/a

Notes:

1. The gender and racial identity questions were not required questions in our survey. Of the 339 participants, 222 answered survey questions about gender and racial identity.
2. The Illinois Computer Science Department does not track gender minorities such as genderqueer or transgender.
3. The percentage of Native American students were too few to report by the Illinois Computer Science Department as it would allow individuals to be identified.
4. The Illinois Computer Science Department did not track "Multiracial" as a racial identity in the 2005-2006 academic year.

Figure 1: A comparison of the undergraduate demographics at the time of the original study and our 2017 study. The undergraduate students reported here represent all computer science majors in the department, including CS+X.

	Graduate Population		Survey Participants	
	2005-2006	2017-2018	Spring 2017	
Total	411	646	61	29 ¹
Men	85.4%	78.8%	34.4%	72.4%
Women	14.6%	21.2%	11.5%	24.1%
Gender Minorities ²	n/a	n/a	1.6%	3.4%
White	28.7%	16.4%	18.0%	37.9%
African American	0.7%	0.9%	1.6%	3.4%
Asian American	10.0%	11.1%	8.2%	17.2%
Hispanic	1.0%	2.9%	1.6%	3.4%
Native American	0%	n/a ³	0%	0%
Multiracial	n/a ⁴	0.6%	0%	0%
International	59.1%	66.1%	18.0%	37.9%
Unknown	0.5%	1.7%	52.5%	n/a

Notes:

1. The gender and racial identity questions were not required questions in our survey. Of the 61 participants, 29 answered survey questions about gender and racial identity.
2. The Illinois Computer Science Department does not track gender minorities such as genderqueer or transgender.
3. The percentage of Native American students were too few to report by the Illinois Computer Science Department as it would allow individuals to be identified.
4. The Illinois Computer Science Department did not track "Multiracial" as a racial identity in the 2005-2006 academic year.

Figure 2: A comparison of the graduate demographics at the time of the original study and our 2017 study.

	Faculty Population 2005-2006		Faculty Population 2017-2018	
	Tenure-track	Other ³	Tenure-track	Other ⁴
Total	52	18	62	23
Men	88.5%	22.2%	85.5%	82.6%
Women	11.5%	77.8%	14.5%	17.4%
URM ¹	n/a ²	n/a ²	4.8%	0%

Notes:
 1. The department identifies faculty as an underrepresented minority if they identify as African American, Hispanic, Native American, or multiracial with at least one of the above.
 2. No racial identity data was collected for faculty in 2005-2006.
 3. "Other" includes other instructional staff such as lecturers and research professors.
 4. "Other" includes other instructional staff such as lecturers and the recently-introduced teaching track faculty position.

Figure 3: A comparison of the faculty demographics at the time of the original study and our 2017 study.

Faculty Participants Spring 2017		
Total	43	25 ¹
Men	44.2%	76.0%
Women	11.6%	20.0%
Gender Minorities	0%	0%
URM ²	2.3%	4.0%

Notes:
 1. The gender and racial identity questions were not required questions in our survey. Of the 43 participants, 25 answered survey questions about gender and racial identity.
 2. The department identifies faculty as an underrepresented minority if they identify as African American, Hispanic, Native American, or multiracial with at least one of the above.

Figure 4: 2017 faculty participants by gender and race.

	Faculty Population 2017-2018		Survey Participants Spring 2017	
	Tenure-track	Other ¹	Tenure-track	Other ¹
Total	62	23	24	9
Percentage	72.9%	27.1%	72.7%	27.3%

Notes:
 1. "Other" includes other instructional staff such as lecturers and the recently-introduced teaching track faculty position.
 2. The survey questions regarding position and title were not required questions in our survey. Of the 43 participants, 33 answered survey questions about position and title.

Figure 5: 2017 faculty participants according to position and title.

policies, departmental values and culture, sense of fit and belonging, and demographics. We expanded our demographic questions and response options to incorporate write-in answers that we received in the original study and to use more inclusive categories for social identities, such as race, ethnicity, gender, disability, and sexuality, than are typically included in such surveys. As in the original study, each topical area within the survey included open-ended response options so students could openly share their experiences with that topic. Many questions also included "other, please explain" options to provide space for students to offer up responses that best reflect their experiences, perspectives, and identities. These open-ended responses provided a rich source of qualitative data and additional context and depth to the quantitative data.

At the time of the Spring 2017 study, the department had 1805 undergraduates and 646 graduates. As summarized in Figures 1 and 2, the department was comprised of 25.6% undergraduate women and 37.8% graduate women. Among undergraduate students of color, the department had enrolled 1.7% African American students, 36.3% Asian American students, and 4.3% Hispanic students. Among graduates, the department was comprised of 0.5% African American students, 49.5% Asian American students, and 0.9% Hispanic students.

In total, 339 undergraduates participated in the survey, representing an 18.8% response rate from the 2017-2018 undergraduate population. For the graduate students, 61 participated, representing a 9.4% response rate from the 2017-2018 graduate population. Compared to our previous study, graduate students were much more reluctant to participate, citing time constraints and additional concerns about anonymity and potential repercussions.

Among undergraduate participants, 222 fully completed the demographic section of the survey. For graduate student participants, 29 out of the 61 respondents shared demographic information with us. In reporting our findings in the following sections, we use this sub-sample when sharing trends disaggregated by demographic categories.

We did not study the faculty in the original 2006 work. This was impossible while we were all graduate students in the department, but we believe it is a piece of the picture that was missing in 2006. In response, we created new survey and interview protocols for use with departmental faculty to incorporate their perspectives and experiences for a more holistic view of the culture. At the time of the Spring 2017 study, the department had 85 faculty. As summarized in Figure 3, this included 62 tenure-track faculty and 23 instructional staff such as lecturers, research faculty, and teaching-track faculty.

In total, there were 34 faculty participants, representing a 40% response rate from the 2017-2018 faculty population. The demographics of the faculty participants are summarized in Figures 4 and 5. Among the participants who answered the gender and race related questions, 76% were men, 20% were women, and 4% are from what the department itself categorizes as an underrepresented minority – African American, Hispanic, Native American, or multiracial with at least one of the above. With respect to position and title, about 72% of participants were tenure-track faculty. The remaining participants we group as "other"; detailing titles further risks the anonymity of our participants.

As an additional note on departmental demographics, the department does not currently collect data on gender and sexual minorities. Our demographic data illustrate that students and faculty from these social groups are present in the department, with between 2 and 4 percent of our undergraduate and graduate student respondents identifying as gender minorities. In addition, close to 20% of undergraduates, 13% of graduate students, and 9% of faculty members who responded to the survey identify as sexual minorities.

4 Results

The results of the study have been categorized into three major themes: Teaching and learning environments, mentoring, and transparency. For each of these themes, we compare and contrast the most recent findings to those from 10 years ago; we also supplement with representative quotes from the surveys or follow-up interviews. Moreover, the issues that surfaced under each of these themes apply across undergraduate, graduate, and faculty experiences, but manifest themselves in slightly different ways.

5 Teaching and Learning Environments

Our 2006 survey revealed significant issues with respect to teaching. Many undergraduates felt that the research focus of faculty and graduate teaching assistants led to poor instruction, problematic classroom environments, and misalignment between the course requirements and their educational goals. More than half of the open ended comments from undergraduate students on how to improve the department were related to courses. Over 40% of graduate students reported finding core requirements unhelpful. As a result, our recommendations included suggestions to improve quality of teaching by adding training for teaching assistants, investing in teaching-focused faculty, and creating greater flexibility in the undergraduate and graduate curricula.

Undergraduates: Do you think that the Illinois Computer Science Department values excellent teaching?

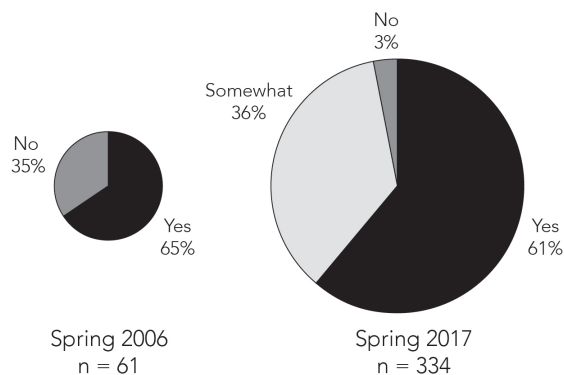


Figure 6: A comparison of the undergraduate perceptions of teaching excellence in 2006 and 2017.

Since the original study, the department has indeed made many of these changes. There are now 15 teaching-focused faculty of various titles, and that community is expected to continue to grow over the next several hiring cycles. Moreover, the core curriculum has both decreased in size, and increased in flexibility, creating a variety of intellectual pathways toward an undergraduate CS degree.

5.1 Undergraduate students

In our original 2006 survey of undergraduates, students were asked the following yes-no question about teaching, "Do you think that the computer science department values excellent teaching?" Of the 61 participants, 21 answered "No". We asked a similar question in our Spring 2017, this time allowing students to answer "somewhat". Only 10 out of 334 undergraduates answered "no" to the same question.

Figure 6 compares the results. We acknowledge that the questions differ in response options. That said, the large number of "somewhat" responses and the qualitative responses then and now indicate a shift in undergraduates' perception of how teaching is valued by the department. In our original study, comments and suggestions on improving the teaching quality in the department were one of the most heavily discussed topics both in interviews and the survey [11].

In Figure 7, we see the results of several survey questions given to undergraduates that contribute to our understanding of the quality of teaching in the department. It is worth noting that, overall, these results are largely positive in the sense that students feel they are learning information that will help them solve important problems and pursue career goals. In addition, a majority clearly feel that their professors and course staff are invested in their success. However, students who disagreed with these statements were more likely to be from historically marginalized backgrounds, including women, gender and sexual minorities, and students of color.

Looking at students' qualitative comments allows us to contextualize students' experiences with these different aspects of teaching further. From the survey comments, we see this overall positive shift in perception of teaching, namely in the introductory courses taught by teaching-track faculty:

"I think we have many excellent professors, especially in lower level classes/required classes. This has helped increasing students' interest in the subject tremendously."

"I've had one experience where I wasn't happy with my instructor. Other than that I was almost always left in awe of the dedication and love that the instructor had for the subject and for teaching."

"I guess, first of all, the low level courses are of real high quality, at least when I took it. Um, 125 was taught in a fun, like, um, manner so that all students – even without a background can understand and get into that...And like, even for like some of the required classes 233, 241, I think all the professors putting a lot of effort in making sure that the students understand and uh, that they think it's interesting."

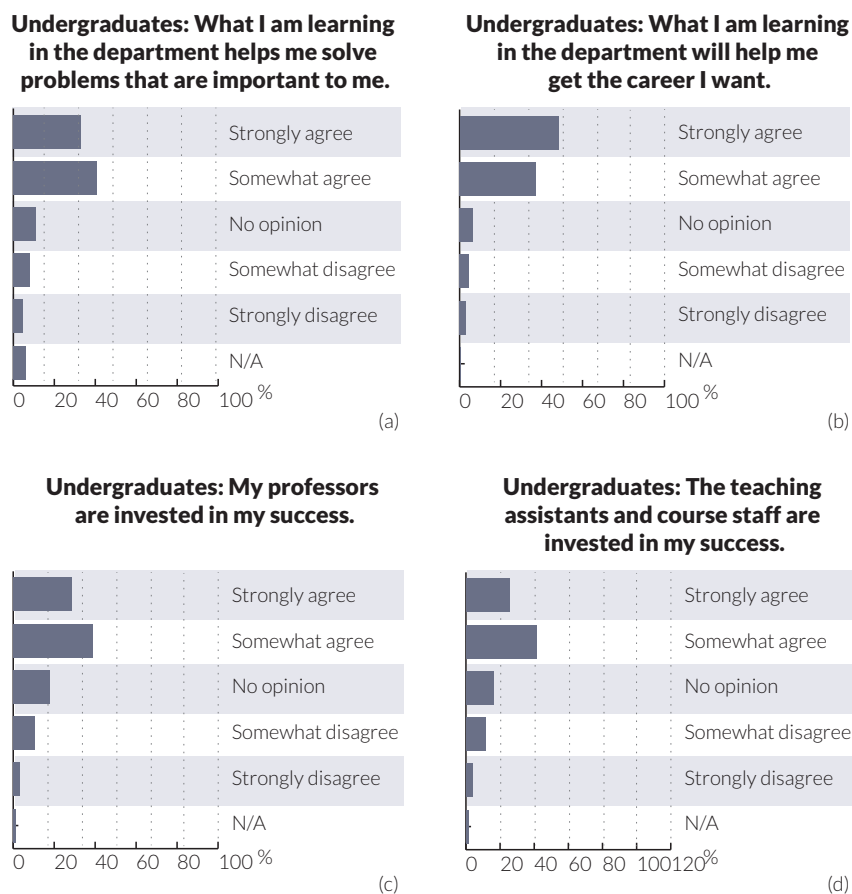


Figure 7: Undergraduates answered four questions about how they value the curriculum and the investment of faculty, teaching assistants, and course staff in their success.

Teaching-track faculty had significant impact on student perceptions about the quality of teaching, with many undergraduates specifically naming teaching-track faculty members and referencing courses taught by them in their comments. Almost all student comments recognize the non-tenure track instructors as being talented and innovative teachers, providing evidence that investing in such a track has improved student classroom experiences.

In both studies, we explored reasons behind classroom absences to better understand students' experiences. In each, students answered, "When you miss a class, what are the reasons motivating you to be absent? (check all that apply)" using the options in Figure 8. In 2006, 66% of students said, "I do not feel that the lectures help me learn", as opposed to 41% in 2017. Similarly, for the statement "I do not like the teaching style of the lecturers," the original study had 49% who agreed, while the more recent survey has only 29% who agree. These findings suggest improvement in sense of learning outcomes accomplishment and pedagogical alignment between students and lecturers. We also see an increase in the sense of time constraints reported by undergraduate students between 2006 and 2017, with more students preferring to watch video lectures (8% v 31%) and feeling like they don't have time to attend all of their lectures (25% v 35%).

Even with these improvements, some students did comment on issues that detracted from the classroom experience, citing examples such as class sizes, problematic classroom behaviors, or professors who are more invested in research. Most of the negative comments centered on the quality of teaching from tenure track faculty, sharing that tenure track faculty did not seem to care and behaved in ways that were detrimental to morale, even when the same students would speak highly of teaching track faculty and teaching assistants.

"Our professors are highly qualified individuals, but they are not always the best at teaching. There are professors with highly regarded resumes, but I learn almost nothing from them in class or lecture."

“When you miss a class, what are the reasons motivating you to be absent? (check all that apply)”

	Spring 2006	Spring 2017
I only miss a lecture if I'm unwell.	N/A	41%
I do not have time to attend all the lectures.	25%	35%
I do not feel that the lectures help me learn.	66%	41%
I do not like the teaching style of the lecturers.	49%	29%
I prefer to watch lecture videos.	8%	31%
Other. Please explain:	58%	17%

Figure 8: A comparison of undergraduate motivations to miss lectures in 2006 and 2017.

“There are some professors here that are more research-oriented, and are not good at teaching. They still teach classes, to the detriment of students.”

“There are many excellent teachers at Illinois but also several who rely on their status in the department or the quality of their research work to forgo their classes.”

“The professors make people feel like they are worthless and can't achieve anything.”

In addition, as reported in our preliminary findings [10], extra training for graduate student teaching assistants has been incorporated into the program, which also seems to have had a positive impact on undergraduate experiences with teaching. During their interviews with us, several undergraduate students mentioned learning a lot from their teaching assistants not only because of their teaching quality, but also because of how relatable they are. For example, one interviewee told us:

“[My professors] seem a little bit disconnected from the actual coursework. It's kind of hard to describe...They talk about things at a very high level. You know, they understand whatever theory's going on. But in terms of actually implementing it...I don't know. So going with TA's, they more recently have finished the coursework and stuff, so they actually get down to the nitty gritty. So I talk to them more - a lot more.”

It is worth noting that almost all of these negative comments came from women, gender minorities, students of color, first generation students, and international students, even those who reported high academic standing.

Our participants also highlighted a number of areas where additional training or professional development would improve classroom experiences. Several undergraduates offered their experiences with undergraduate classroom assistants (CA's), whom they felt could use training to support their work in the classroom. For example, one student said: *“I'm an undergraduate like, CA, and they don't provide training for a lot of the CA's. And I'm like this is not good. Not everybody knows how to teach. Not everybody knows how to manage...And just like a basic, like one-hour little course or something, would, I think, benefit a lot.”*

In addition, several undergraduate students described concerns about gaps in teaching assistant training for crisis situations. A senior undergraduate student described one such experience. Led by a teaching assistant, the students were instructed to work in groups on an in-class assignment. She said she got behind on the problem, and started working on it independent of her group. As the teaching assistant circled the room, she saw the student's work and said, *“good job, you figured this one out, don't tell these guys because they need to work it out for themselves too.”* The student went on to say,

“And this kid in my group got so mad that I figured out this problem, he literally stood up, threw his chair back and was like, “you're just a freaking girl, you must have cheated on this thing, there's no way...” Nobody did a thing. Met with a roomful of silent bystanders to the violence, the yelling, the insults, the chair-throwing, she said, “I just left the class crying.”

This experience is just one among many troubling interactions described by students in which TA's, CA's, peers, and even faculty members seemed underprepared to intervene in the situation, leaving the target of the behavior unsupported and the inappropriate behavior unaddressed. Both undergraduate and graduate students in our study described situations

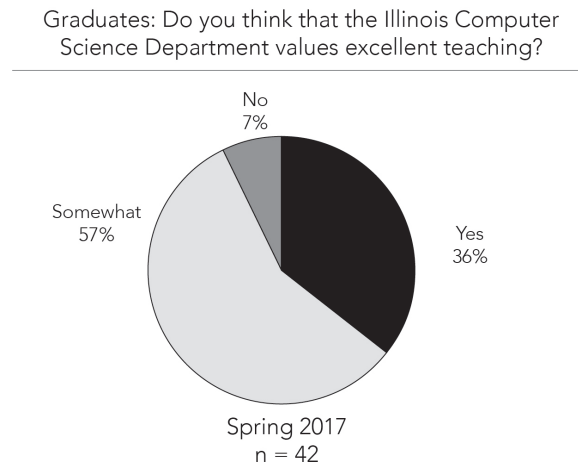


Figure 9: Graduate perceptions of teaching excellence in 2017. Note that, unlike undergraduate participants, graduate participants were not asked this question in 2006.

in their courses, online discussion groups, student clubs and organizations, and research groups where they witnessed or directly experienced hostile behavior, harassment, and bias, and felt unsure about how to handle the situations as teachers, students, or peers. For example, when asked whether she had witnessed inappropriate behavior in the department, one undergraduate student spoke generically about seeing such behavior from both students and faculty in the context of coursework and social interactions. We asked her, *"How do you handle that when it happens?"* She offered that sometimes it can be useful to call out the behavior, but that she had only once seen a person do so effectively. She said, *"but that person wasn't from computer science...they were from physics."*

More often than not, participants told us that these situations were met with awkward silence, mostly due to the shock of the situation and fear of further isolation and career repercussions. Many explained that the culmination of such experiences, particularly when they have been the target of these words and behaviors, has had a deflating effect. One student said that she has had to learn to tolerate these behaviors, explaining: *"I don't feel a sense of hope that like, oh you know, just push through and it's going to get better, once you get into industry – no. It's just how it is and you have to get used to it or get out of it. It's not really something that's going to be fixed within the next few years."*

5.2 Graduate students

Figure 9 summarizes the graduate perception of how the department values teaching excellence. Comparing the two groups of students, 61% of undergraduates believe that the department values excellent teaching; only 36% of graduate students believe the same. However, it is worth reiterating that response rate among graduate students was quite low, which was a stark contrast with the undergraduate response rate and with the response rate among graduate students in the 2006 survey.

In the qualitative data, again contrasting with undergraduate responses, graduate students were much less favorable about the importance of teaching to the department.

"So what I saw is, uh, professors who are good researchers aren't good teachers. And I believe that there should be instructors or just teaching instructors that their passion is teaching. Like Cinda is teaching and she is a great teacher. But for professors who are made to do that – I had professors who come to class and say 'oh, I'm doing this department duty.'"

"Undergraduate courses have a much higher quality of teaching in my experience. In graduate courses, students tend to present papers instead of the professor teaching which is valuable in a sense but is not a quality teaching style."

"Undergraduate courses are better by a huge margin. Graduate courses by and large are poorly taught; it is rare to find a graduate course that is taught with as much enthusiasm as an undergraduate course. This, I think, has a lot to do with priorities of instructors."

Graduates: Did the Illinois Computer Science Department provide you with the necessary training and resources to perform the duties of your assistantship?

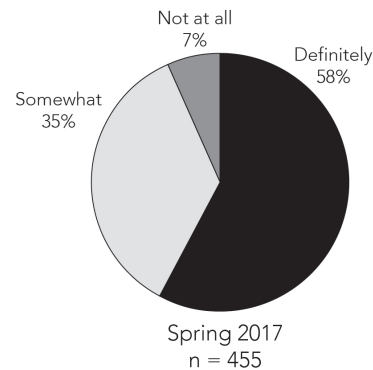


Figure 10: Graduate perceptions of assistantship preparation in 2017.

As far as teaching preparation for graduate assistants, the department now offers a seminar course, CS591 TA, or “Teaching Assistant Training,” to prepare its teaching assistants for their service. All Ph.D. students in the department are required to fulfill a teaching assistant role for one semester and, in advance of that assignment, are to participate in the semester long course. Student interviews enumerated some of the course’s topics, including lesson planning, encouraging student participation, protecting student privacy, cultural sensitivity and Title IX compliance. During the pilot, many graduate students commented that such training was both useful and a strong indicator that the department valued teaching and their role as teaching assistants. In the full study, overall, students commented that this course was helpful, but felt it did not go far enough to prepare them.

To find out how graduates felt about the ways in which the department prepares them for their assistantships, we asked the following multiple choice question:

- **For those participants that have assistantships, did the department provide you with the training and resources necessary to perform the duties required for your assistantship(s)?**

Figure 10 shows how students answered with "Definitely", "Somewhat", and "Not at all."

While 58% of participants responded with "Definitely," 42% still feel underprepared. As we saw from the previous section, gaps in preparation for taking on the full spectrum of responsibilities related to teaching, both in and out of the classroom, have an impact on undergraduate student perceptions of their learning experiences. As one undergraduate student explains:

"I would like to see T.A.s with more instruction on how to teach a class. The first course a student takes in Computer Science is the most critical, because it is that course that will make a student decide whether to stay in the department."

Gaps in preparation impact TA’s abilities to navigate teaching responsibilities skillfully. The qualitative responses shine some light on why students feel underprepared. First, there were discrepancies in how the seminar requirement was enforced, with several graduate students in our study, all men, reporting that they did not participate in the seminar before accepting a teaching role in the department. One student explained that because his course evaluations came back satisfactory, he was never required to take it after skipping the seminar before teaching. Another student offered,

"I actually skipped it and I was allowed to skip it because it’s offered only in fall and I wasn’t a TA in Fall ’14 when I joined, I was an audit in Fall ’14. But then I chose to be a TA in spring and then that... seminar wasn’t offered in spring."

Those students who had taken the course also identified gaps in their preparation for teaching roles. One third-year Ph.D. student who described his career goal as “tenure-track faculty member” was frustrated by the lack of teaching preparation and lack of opportunity he found in the department. He offered, “Because I don’t think you can just grade your advisor’s exams and then say “I’m a teacher now.”

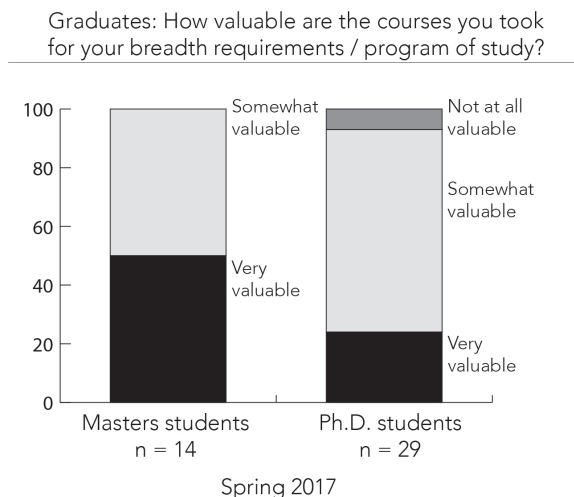


Figure 11: Graduate perceptions of the value of their course requirements in 2017.

In particular, students expressed a lack of preparation for handling difficult, emergency, or crisis situations that surface with their students. A second-year Ph.D. student described “heartbreaking” stories she heard from students during her office hours. She wanted to help, “*but I have no idea where to refer them, for example, for mental health or counseling. I don’t have that information except like if I actually go and search on the internet.*” She felt very unprepared to handle emergency or crisis situations presented by her students and described a lack of awareness of the departmental or campus resources to which she could direct her students in these moments.

Among the 42% who reported feeling underprepared for their teaching responsibilities, 70% were from historically marginalized backgrounds and/or were international students, who often served as informal mentors, role models, and sources of support for marginalized undergraduate students.

Masters students and Ph.D. students each have a set of course requirements for their respective degrees. To find out how graduate students valued their own coursework, we asked the following multiple-choice questions:

- **(For Master’s students) How valuable are the courses you took for the breadth requirements?**
- **(For Ph.D. students) How valuable are the courses you took for your program of study?**

Figure 11 compares how Master’s and Ph.D. students answered these questions with with “Very valuable”, “Somewhat valuable”, and “Not at all valuable.”

Similarly, to find out how graduate students felt about how their own coursework aligned with their own career goals, we asked the following multiple-choice questions:

- **(For Master’s students) Did the course requirements help prepare you for the career you envision for yourself after graduation?**
- **(For Ph.D. students) Did the program of study requirements help prepare you for the career you envision for yourself after graduation?**

Figure12 compares how Master’s and Ph.D. students answered these questions with with “Definitely”, “Somewhat”, and “Not at all.”

5.3 Faculty

Figure 13 summarizes faculty perception of how the department values teaching; here, 47% feel they do, in contrast to 61% of undergraduates and 36% of graduate students. In the qualitative responses, the ways in which faculty believed the department valued excellent teaching were more nuanced, and were often framed through the lens of the immense growth in enrollment.

First, the faculty noted the emphasis and value the department has placed on teaching faculty, including the professionalization of the teaching track faculty. One participant wrote,

Graduates: Did the course requirements help prepare you for the career you envision for yourself after graduation?

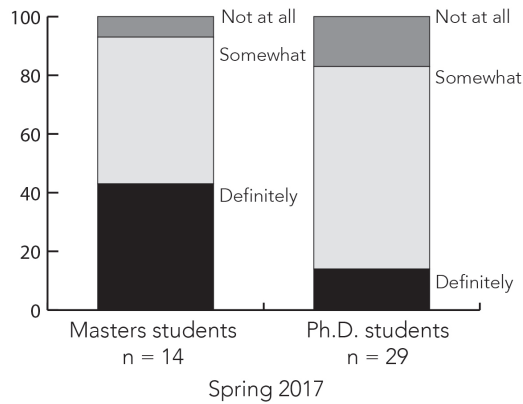


Figure 12: Graduate perceptions of how their course requirements prepare them for the career they envision for themselves in 2017.

Faculty: Do you think that the Illinois Computer Science Department values excellent teaching?

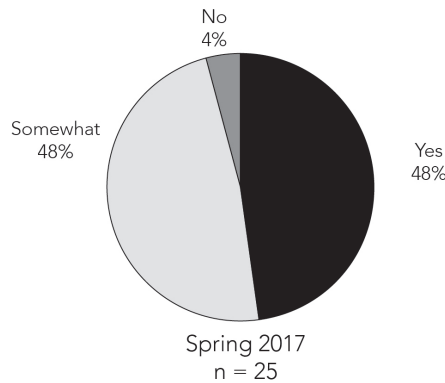


Figure 13: Faculty perceptions of teaching excellence in 2017.

"CS greatly values teaching faculty. The department has made a concerned effort to promote teaching faculty, to convert non-faculty teaching ranks (lecturers and instructors) to faculty ranks, and to bring these faculty into our governance processes and important committees on an equal footing with tenure-track faculty."

Faculty were also pleased with the creative measures taken to support teaching as the student population has grown.

Some of the larger introductory classes that the ... that our teaching faculty primarily handle – they've started hiring graduate assistants who just do administrative things. You want a re-grade? Go fill out this form online. You want to take a conflict exam, go fill out this form online...so all that data stays off the faculty work load.

That said, many faculty are unsatisfied with how teaching is evaluated and supported. In Figure 14, we see that only 25% of faculty respondents felt the department offered resources to help faculty improve their teaching. As far as evaluations, when asked "How accurately do you think your student evaluations reflect the effort you put into teaching?", only 44% of respondents thought their evaluations were somewhat or very accurate, and when asked "How accurately do you think your performance evaluations reflect the effort you put into teaching?", only 30% answered somewhat or very accurate.

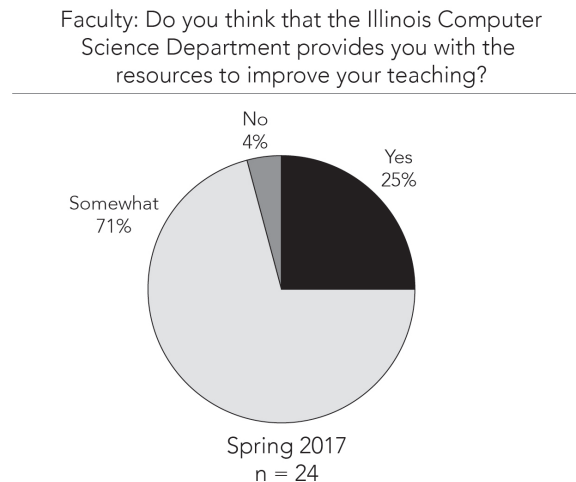


Figure 14: Faculty perceptions of resources provided to improve teaching in 2017.

In faculty comments, it became clear that while great lecturers are lauded, faculty feel pressured to teach well without much support, and most faculty are evaluated simply by the sheer numbers of students they teach.

"Yes, our most famous lecturers receive a lot of recognition for their teaching. However, although I was working very hard and putting an immense amount of time and effort in my teaching, I didn't receive much acknowledgement or recognition from the department. My ICES scores never went above average either."

"Most of the time time our annual review consists of being shown two graphs. One is how many students you taught in the last five years. And [the other] was your average teaching score in last five years."

"You can go and whatever, day dream in your annual report or in your meeting with the boss, whatever you want. I significantly restructured the course, you know. And nobody values that. None of your peers going to attend your lectures. There is nobody who is going to look on your website to see how the course looks like or anything like that. I mean the only thing is ICES scores."

"The department puts a great emphasis on teaching and the department head stressed this issue putting great pressure on all faculty to improve teaching. What is missing is to provide assistance to improve teaching."

"Research clearly comes first. Mediocre teaching is OK."

"I am not aware of how outstanding dedication and results in teaching are rewarded by the department. My understanding is that research is most critical and irreplaceable for tenure and promotion with teaching just needing to be on par."

There is an immense sense of unfairness in how classes are assigned. One faculty described a kind of evolution of the rules by which faculty teaching assignments had changed but were never really written down:

"About five years ago there was this thing when they said you need to teach one large class and two small, something like that. But then at some point that shifted... It became literally, this butts in the seats. And now, again, I understand why they do that, because that's like tuition dollars translate into that. But this was never formally announced... If they really want butts in the seats then I would rather teach one of 200 and two of twenty. Rather than three of 80. Because if I teach three of 80, you know, it's just neither good for the students nor for me."

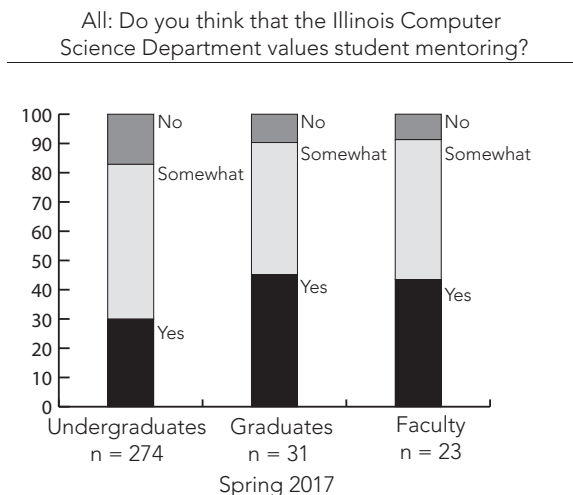


Figure 15: Comparing undergraduate, graduate students, and faculty perceptions of how the department values mentoring in 2017

6 Mentoring

Our 2006 study uncovered a student appetite for multiple kinds of mentoring relationships, but a lack of opportunity to find mentors. At the time, 18% of undergraduate and 53% of graduate students reported having a mentor. Many participants wished for some kind of mentor but felt unsure about how to find one. In the 2017 survey, a larger percentage of undergraduate and graduate students reported having a mentor, but undergraduates in particular seemed to stumble on how to engage their mentors. Similarly, faculty reported a lack of support in their finding their own mentors as well as frustration with the Faculty Mentor role for undergraduates.

One of the questions we asked of all undergraduates, graduates, and faculty was the following:

- **(To students) Do you think that the Illinois Computer Science Department values mentoring?**
- **(To faculty) Do you think that the Illinois Computer Science Department values student mentoring?**

Figure 15 compares each group's answer to this question.

The following sections examine in greater detail the ways in which these three groups experience mentoring in the department.

6.1 Mentoring for Undergraduate Students

Today, undergraduates are offered a three-tiered approach to advising. First, the Academic Office offers two full-time student-facing academic professionals. Second, every undergraduate is assigned a Faculty Mentor that they are required to meet with each year. Third, students are encouraged to get advice from fellow students, particularly advanced students, in their classes or over a Piazza platform.

Despite these mentoring opportunities, not every undergraduate reports having a mentor. Even so, more undergraduates reported having a mentor in 2017 than in 2006. Figure 16 compares the number of undergraduate students who reported having a mentor in 2006 and in 2017.

To understand how undergraduate students are leveraging these multiple tiers of mentorship opportunities, we asked students about their interactions with their mentors. The survey asked students about their interactions with:

1. Faculty Mentors.
2. The Academic Office
3. Other mentors, or people that they had self-selected as their mentors through formal mentoring programs, student clubs, or other means.

To find out the kinds of topics that undergraduates seek help, we asked three questions:

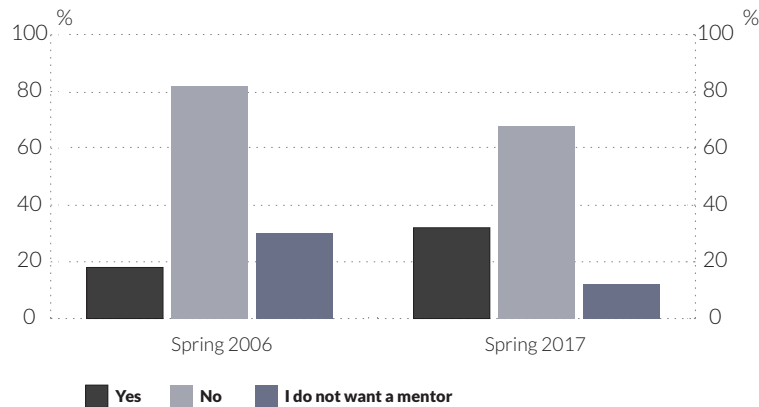
Undergraduates: Aside from your Faculty Mentor, do you have any mentors?

Figure 16: Comparing undergraduate students with mentors in Spring 2006 and Spring 2017. In 2006, 18% of undergraduate students reported having a mentor ($n = 61$). In 2017, 32% of undergraduate students reported having a mentor ($n = 284$). Note that in 2006, undergraduates were not required to meet annually with an assigned Faculty Mentor; that year, the survey asked of undergraduates, "Do you have any mentors?"

- **Think about your interactions with your Faculty Mentor. On what topics do you seek his or her help or advice?**
- **Think about your interactions with the Academic Office. On what topics do you seek their help or advice?**
- **In addition to the Faculty Mentor, some students establish other mentoring relationships. In these cases, a mentor is defined more broadly as a trusted counselor, fellow student, colleague or guide. Mentoring relationships can be defined either by a formal mentoring program such as the Mentor Network or an informal mentoring relationship you define. Consider the people you were thinking about [as your mentors] When you interact with them for mentor-like discussions, what topics do you discuss?**

For each question, we supplied a standard list of topics, listed in Appendix A. Participants selected all topics that applied. Figure 17 summarizes the twelve most popular topics for which students are seeking advice across their multiple kinds of mentors; topics are listed from most popular to least popular.

We now discuss the results for each kind of mentor in turn.

6.1.1 Faculty Mentors for Undergraduate Students

Since the original study, the department made significant improvements in its undergraduate advising policies. For one, every undergraduate is now assigned a Faculty Mentor; students are *required* to meet with their mentors once per year. This requirement is enforced using Spring registration holds. As published on the department's website, the Faculty Mentor's role for the undergraduate is to "*be a central point of contact and a liaison*" [33] between the student and faculty. Faculty mentors can offer assistance with choosing courses, identifying possible specializations within the curriculum, and provide information on career paths or graduate school. Installing the infrastructure and processes to assign every undergraduate a Faculty Mentor is an important first step in developing student-faculty interactions and providing important educational and career support to students.

To explore student experiences with these new infrastructure and processes, the survey asked:

- **Why do you meet with your Faculty Mentor? (open-ended)**

For this question, many students focused on the required aspect of this open-ended question. Of the 190 students who answered this question, 110 (or 57.8%) commented on how meetings with the Faculty Mentor are required and stated that this was the primary or only reason for meeting. Students wrote,

"Only because I have to, in order to register."

"To meet the requirement and check to make sure that I am on track and see where I want to go for my career."

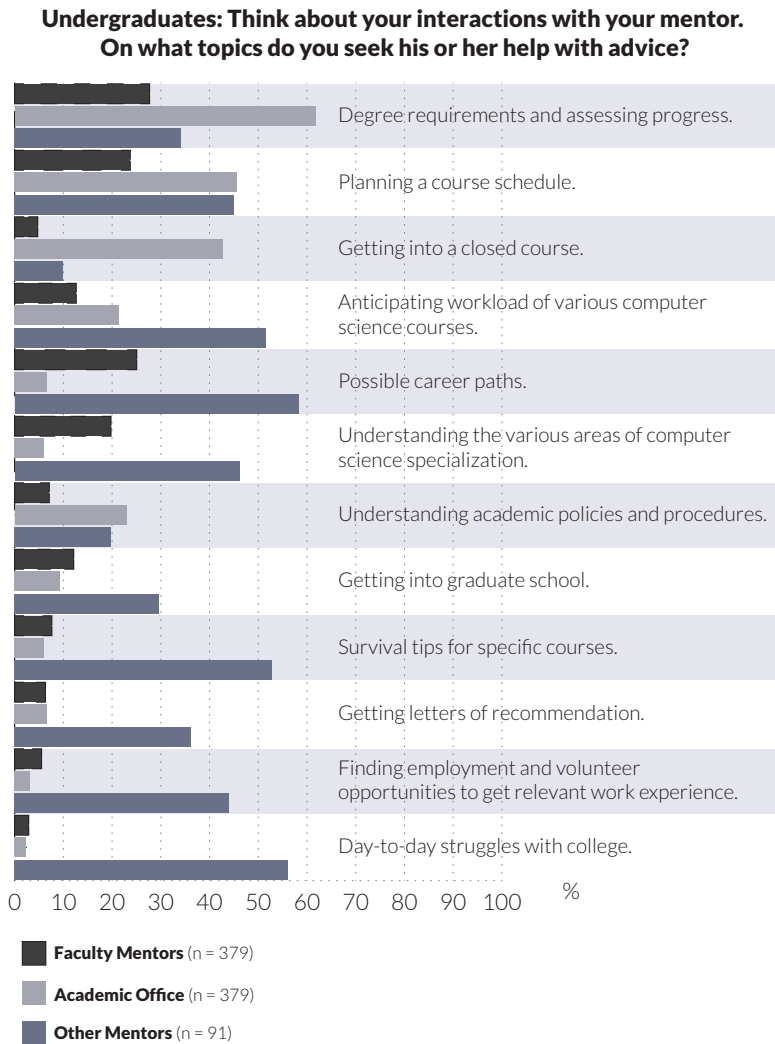


Figure 17: Undergraduate students were asked about discussion topics with their multiple kinds of mentors.

"Honestly? Simply because it is required to register for classes."

Rather than experiencing mentoring meetings as a valuable component of their educational and career development, most students equated these meetings to bureaucratic hurdles to be overcome so they could register for classes. This could be, in part, because of how the mentoring relationship is framed - it is a requirement. Sixty percent of underrepresented minority women and over half of white men reported meeting with their faculty mentors because of this reason and, across demographic groups, this rationale for meeting was predominant.

Another of the questions we asked undergraduates was the above-mentioned, *"Think about your interactions with your Faculty Mentor. On what topics do you seek his or her help or advice?"* The top five picked among undergraduates (n = 379) were:

- Degree requirements and assessing progress. 106. 28%
- Possible career paths. 97. 26%
- Understanding the various areas of computer science specialization. 77. 20%
- Getting into graduate school. 47. 12%
- Survival tips for specific courses. 29. 8%

We observe that undergraduates are seeking out mixed categories of topics from the Faculty Mentor. The most popular topic – Degree requirements and assessing progress – comes from a place of academic advising, with students asking

questions like, *"These are my current semester classes. Will I graduate on time?"*. The second most popular – Possible career paths – comes from a place more aligned with professional mentorship, *"What kind of job will I want when I graduate?"*

In the interviews, a junior explained her interactions with the Faculty Mentor,

"So, we're assigned a faculty mentor for each undergrad student. So, usually these are like 15 minutes-ish meetings where we meet up once per semester or something. And then discuss course schedules, and future planning. Some of the stuff. Usually it's a pretty quick discussion. Seems like, I usually know what classes I want to take. She went on to reflect on the value of her Faculty Mentor, I think it's definitely helpful for freshmen and sophomores when like they're a little bit confused on the difficulty level of each class. They don't know what to expect from them and stuff."

Another junior talked about the limitations of their Faculty Mentor,

"I was thinking of switching majors before and (pause) she didn't really know what to say. So, I just kind of talk to the people in the academic office."

Yet another junior agreed, describing his own interactions with his Faculty Mentor like so,

"I asked him what I should do with my summer...it was just like, well, if you don't have an internship then work on personal stuff, and that was it."

Another participant wrote about what he wished from a Faculty Mentor,

"I'll put it bluntly: as a gay man, I would love to have a queer faculty mentor who could talk about their experiences in the field. But, I would only be interested if that faculty wanted to be a mentor to queer students, and it's a huge burden to ask of somebody if they didn't already know they wanted to do that. As much as something like an invested queer faculty mentor would be the ideal scenario, I would still much rather take anybody else who wanted to talk with me and had the ability to make me for me even if they were different from me instead of somebody who looks like me who doesn't care."

One woman, a sophomore, compared her own experiences with those of others,

"...but like on the other hand, I've heard of some people who just got lucky with their mentors. And they just like had a mentor that...is in their field, or has listed some type of experience that they had had, so it's just like a really great conversation. I think my mentor would be useful if we had those same alignments, but we don't. She's like – you good? And I'm like, yea, mostly good. And that's it."

Meanwhile, another woman felt like she was one of the lucky few,

"I was totally crying in her office and she like actually cared. She was like, I think you need to be like talking with someone. And I really respected that. I was like, yea, I agree, but I can't get in at the counseling center. Because you have to dial in at 7am. And then they, half the time they don't have a slot for you. And so, she fought for me to get a pre-scheduled appointment so I could talk. So, I feel like she really cared. ...she's been a great resource. I don't think that's consistent."

6.1.2 Academic Office

We asked undergraduates about the topics they discuss with the Academic office; students could choose as many as were relevant from the list in Appendix A. The top five picked among undergraduates (n = 379) were:

- Degree requirements and assessing progress. 234. 62%
- Planning a course schedule. 173. 46%
- Getting into a closed course. 162. 43%.
- Understanding academic policies and procedures. 87. 23%
- Anticipating workload of various computer science courses. 81. 21%.

We observe that, among this top five, undergraduates are seeking the help from the Academic Office on academic matters. Qualitative data from undergraduate participants shows a coherent set of academic reasons that students visit the office:

"I meet with the staff in the Academic Office so that I can plan out what classes I should be taking so that I may graduate on time."

"To go over scheduling recommendations for upcoming semesters."

"Usually to figure out my future course schedule, for example, to talk about what to take concurrently with CS 241, or what core courses can be taken concurrently, or workload of a course."

In some cases, 1-2% of participants visit the Academic Office to get psychosocial support, like "Survival tips for specific courses" and "Day-to-day struggles with college." Undergraduates wrote that they visit the Academic Office when:

"Well, when I am struggling with several coursework or when I cannot get into a specific closed course, I would ask them for help."

"I meet with staff usually to get help for class scheduling and stress."

"I would meet with them if I have any questions about my degree or if I am falling behind in a class."

"When I feel bad about not getting a class that I wanted or asking about small details regarding classes or graduation"

6.1.3 Other Sources of Undergraduate Mentors

Only 91 undergraduates, or 26%, report having a mentor other than their Faculty Mentor. Largely, undergraduates reported that other students in the department or elsewhere on campus were their mentors. For the students who reported having additional mentors, we asked the same question. "On what topics do seek his or her help or advice."

- Possible career paths. 53. 58%
- Day to day struggles with college. 51. 56%
- Survival tips for specific courses. 48. 53%
- Anticipating workload of various computer science courses. 47. 52%.
- Understanding the various areas of computer science specialization. 42. 46%.
- Planning a course schedule. 41. 45%.

One LAS student who seemed to be falling through the cracks spoke highly of an unofficial mentor she'd found for herself.

"And I do have an unofficial mentor...She's a CS grad, you know...She's been helping me with which courses to take. This is unofficial, though. Totally off the record. I just met her one day in my residence hall. She was walking by and I had been telling a friend of mine that I was trying to transfer in as DGS. And she stopped and went 'you're in DGS?' And I was like, yes I am. 'You're trying to transfer this year?' Why yes. I am. She goes 'that's what I did.' I don't know how we spoke for 4 hours about what courses to take to get in; who to talk to; who to...So, she was really helpful about not just the logistics of it, but the actual like the mentality. You know, these things are so random. Um, and I was very lucky to have that."

We also asked undergraduate students the open-ended question, "From whom do you get the most support you need to be successful?" 177 students answered this question. While many students gave answers mentioning multiple kinds of folks – for example, "My girlfriend and my friends" – the most-mentioned, open-ended answers fit the following categories:

- "My friends": 68. 38%
- "My peers": 48. 27%
- "My family": 39. 22%
- "Myself:" 26. 15%
- "Faculty:" 15. 8%

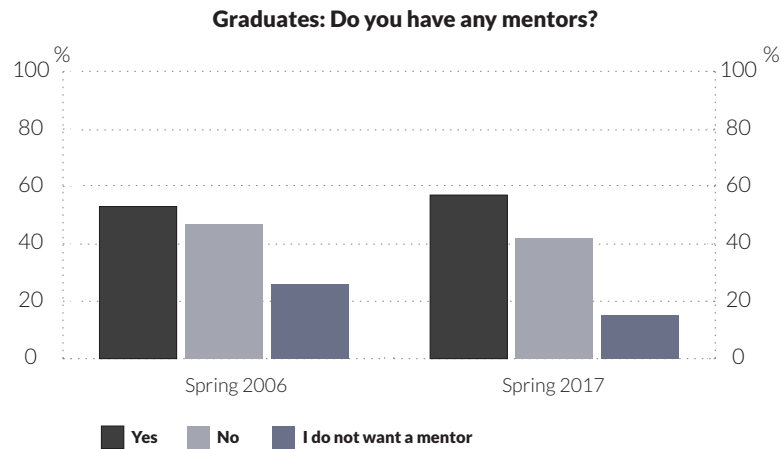


Figure 18: Comparing graduate students with mentors in Spring 2006 and Spring 2017. In 2006, 53% of graduate students reported having a mentor (n = 58). In 2017, 32% of graduate students reported having a mentor (n = 33).

6.2 Mentoring for Graduate Students

In 2006, 53% of graduate students reported having a mentor (n = 58). In 2017, 32% of graduate students reported having a mentor (n = 33). Figure 18 compares the number of students who reported having a mentor in 2006 and in 2017.

To understand how graduate students are leveraging the mentorship opportunities they do have, we asked students about their interactions with their multiple kinds of mentors. The survey asked students about their interactions with:

1. Advisors.
2. Other mentors, or people that they had self-selected as their mentors through formal mentoring programs, student clubs, or other means.

To find out the kinds of topics that graduates seek help, we asked two questions:

- **Think about your interactions with your advisor. On what topics do you seek his or her help or advice?**
- **In addition to their advisor, some students establish other mentoring relationships. In these cases, a mentor is defined more broadly as a trusted counselor, fellow student, colleague or guide. Mentoring relationships can be defined either by a formal mentoring program such as the Mentor Network or an informal mentoring relationship you define. Consider the people you were thinking about [as your mentors] When you interact with them for mentor-like discussions, what topics do you discuss?**

For each question, we supplied a standard list of topics, listed in Appendix B. Participants selected all topics that applied. In addition, we asked graduate students about the other kinds of help they wished they could get from their advisor. In an open-ended response, one student wrote. *"None. I'm happy with the help from my advisor."*

The remaining answers to this question expressed wishes for greater psychosocial support. Examples include:

"We primarily discuss research, anything else is considered a distraction and an intrusion."

"I wish that I felt more comfortable discussing some of the more personal issues described above with my advisor— at the current stage in our relationship, we basically only discuss research."

"Work/life balance, an opinion about careers in academia that isn't highly biased towards thinking that academia = the 'best' career and anything else is 'settling' or 'lesser'."

"I wish I had a better opportunity to discuss coping strategies for graduate school life, especially with dealing with large amounts of clustered failure."

"My advisor maintains a very clear division between personal and work life. It can be off-putting at times. As a result, I haven't felt very comfortable discussing issues such as workload, stress, and other such issues."

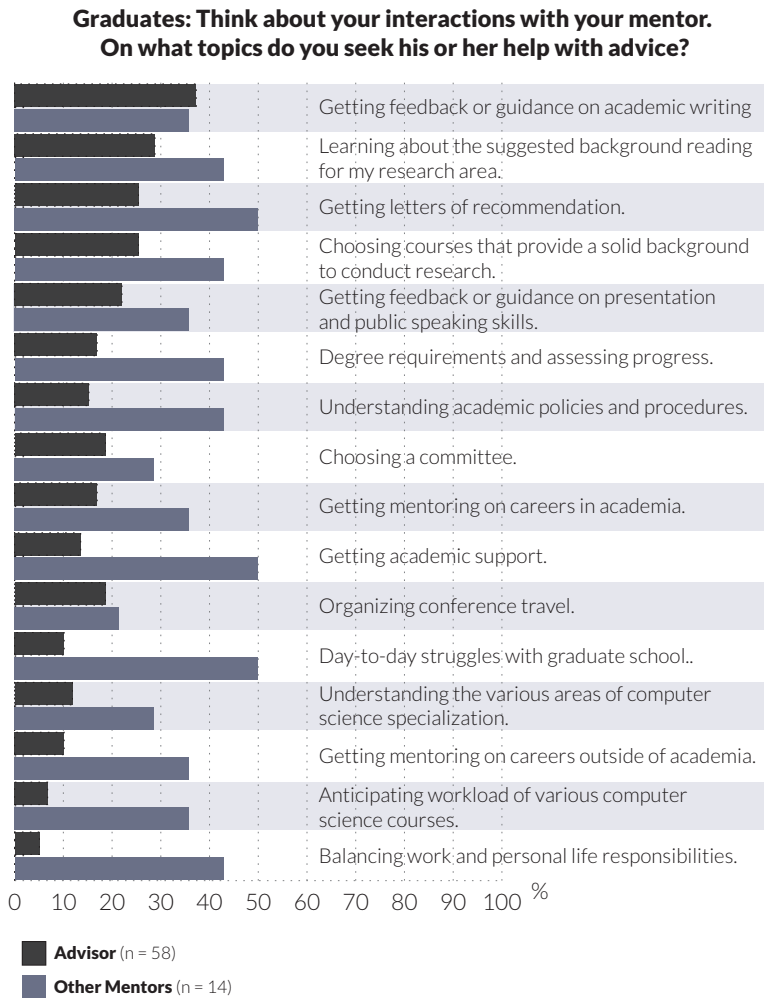


Figure 19: Graduate students were asked about discussion topics with their graduate research advisors and other mentors.

One faculty participant underscored the challenges of graduate students who may be relying on only their research advisor for mentorship,

"I do not get the sense that a significant fraction of [undegraduate] students are lacking in mentorship or resources. I am not sure about the graduate students, I imagine their only mentor is often their advisor, which may be bad."

Acknowledging that graduate students benefit from a network of mentors that can support them in their multiple modes of work, we asked about other sources of mentors.

- **Aside from your advisor, do you have other mentors?**
- **Who are the people you consider your mentors? (check all that apply)**

In response to the first question, 42% of graduate students reported that, aside from their advisor, they had a mentor. Figure 20 summarizes the responses to the second question. It demonstrates that graduate students have mentors from multiple kinds of folks – from other students in institutionalized organizations to faculty outside of the department. While it is positive to see that students are building these networks of mentors, it seems that these networks are built in a largely ad-hoc manner.

Some graduate students described peer mentorship relationships, but expressed worry whether the person "counted" as a mentor:

Graduates: Who are the people you consider your mentors? (check all that apply)

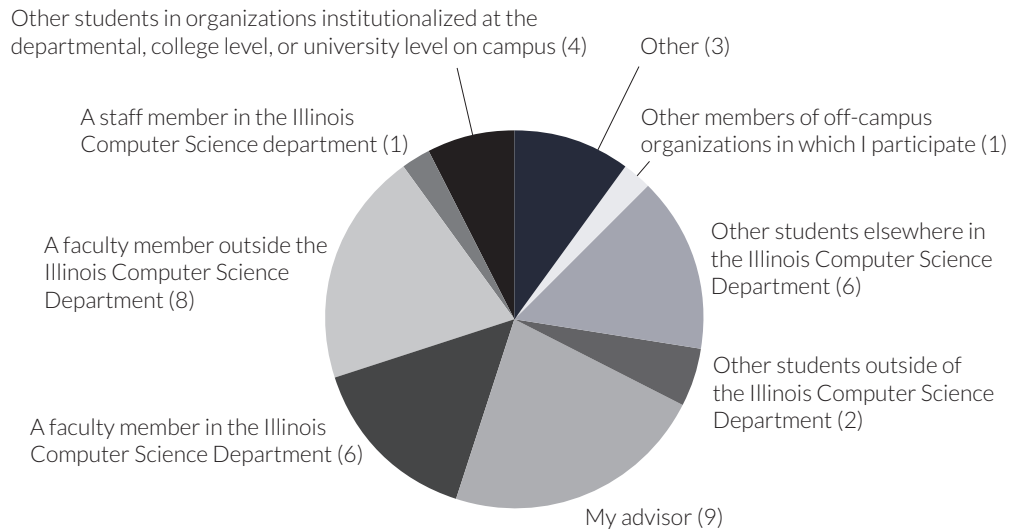


Figure 20: Graduate students were asked about the sources of their other mentors. Of the graduate students, 42% reported that, aside from their advisor, they had a mentor.

"I have an older Ph.D. student who's working – I'm working very closely with him. Um, but like it's not like he's responsible for anything. Like he's not responsible for me or like to really answer any of my questions. But I'm just – you know – we have a lot of emails back and forth."

A graduate student who also attended the university as an undergraduate described only one mentoring relationship like so,

"I had older undergrad students that worked with me to help teach. And we made some assignments...and infrastructure improvements. And so I guess would say, I did have somebody...yea. Probably my mentor. In some senses."

One first-year graduate student described a departmental mentoring program that benefited her and how how she had created her network of mentors from people she had happened to meet in the department.

"My first semester they had a program called like, it was like a mentorship program. You were assigned a mentor that was an older grad student that had volunteered for this program and they helped you through your first year. I got another person at [in my research area] who immediately invited me to a little hangout at her apartment with her friends from [other research areas]. And so, I got to know that group of people real well and that's already three different research areas. And I kept getting invited to their events, meeting more people. And then the CSGSO...started doing weekly happy hours on Friday's. I don't like drinking or anything, but I thought this is a good opportunity to socialize and meet more people. So, I met more people that way too."

We also asked graduate students the open-ended question, *"From whom do you get the most support you need to be successful?"*. 19 participants answered this question. While many students gave answers mentioning multiple kinds of folks – for example, *"Myself, my friends, my family"* – The most-mentioned open-ended answers fit the following categories:

- "My advisor": 10. 52%
- "My peers": 6. 31%
- "My family": 4. 21%
- "Faculty:" 4. 21%

- "Myself:" 4. 21%

One participant answered the survey question this way,

"My advisor and faculty mentor, but I still feel that I am not getting the support I need to be truly successful, which is leading me to consider different career paths."

Another answered,

"I don't get support from anyone at Illinois. "

In the interviews, one graduate student described how her own definition of success stood apart from the department's culture:

"I would assume that the vast, vast, majority of them thinks that work-life balance is completely unnecessary, and in fact a hindrance for success. They think of humans as like these machines that just output a certain amount of work per hour. And the more hours you can do the better. But unfortunately, we have to do things like eat and sleep so I have to cut into my productivity by having work-life balance. Whereas, I feel like it's becoming increasingly obvious that the quality of your work is going to decrease steeply if you don't sleep enough, you know, eat, take time out. But I don't get the sense that a lot of other people in CS share that opinion."

As was the case with disparities in teaching, lack of mentoring support was more frequently reported by marginalized graduate students, particularly in key areas that would contribute to their professional development and in navigating issues of bias and work-life integration.

6.3 Mentoring for Faculty and Faculty as Mentors

Faculty members have many mentoring obligations and opportunities. They mentor peer faculty and junior faculty. They mentor graduate students and undergraduate students in a variety of contexts. This section discusses the two themes uncovered for faculty mentoring. First – like the graduate students of the department, faculty are building their own mentoring networks in largely ad-hoc ways. Second, faculty stretched thin from a substantial enrollment increase would benefit from the elimination of the Faculty Mentor role as currently structured, a role that has excellent intention but problematic execution.

6.3.1 Mentoring for Faculty

Like students, faculty benefit from having a network of mentors that can support them in their multiple modes of work. To understand the faculty experience of their own mentoring, we asked:

- **Have you been satisfied with the level of mentoring you've received from the Illinois Computer Science Department?**

Among the 25 faculty participants who answered the question, most answered "Somewhat dissatisfied", at 36%:

- "Very satisfied": 2. 8%
- "Somewhat satisfied": 5. 20%
- "Neutral": 4. 16%
- "Somewhat unsatisfied:" 9. 36%
- "Very unsatisfied:" 1. 4%
- "Not applicable:" 4. 16%

As we did with students, we asked faculty about whether or not they have mentors.

- **Do you have a mentor?**
- **Why don't you have any mentors? (check all that apply)**
 - I am having trouble finding a mentor**
 - I do not have time for mentoring activities.**

- c. I am uncomfortable seeking out a mentor.
- d. I do not want a mentor.
- e. I do not need a mentor.
- f. Other, please explain.

Of the 25 faculty who answered the question, "Do you have a mentor?", 16 reported not having a mentor. Of the 16 who reported not having a mentor, 10 answered "Other" as to why not, citing a non-existent or ineffective mentoring program as the reason. Both new and established faculty expressed this as a reason. For example, a tenure-track professor in the department for over 15 years wrote,

"The mentoring program was not effective when I joined the department, and I did not receive much mentoring."

Similarly, a faculty of just two years wrote,

"Upon followup with administration, role and assignment of mentors was ambiguous."

Another who reported being in the department for almost ten years wrote,

"I was never assigned a mentor formally by the department. I had to find my own, which worked great. However, there was no department's involvement in the process."

Yet others described the mentoring landscape in this way,

"There are periodic efforts to formalize mentoring and individual faculty members try to be supportive of new faculty hires, but by and large the system remains informal and dependent on individual relationships."

"I have great 'unofficial' mentors but we had to convince Rob to re-instate a mentoring program."

6.3.2 Faculty as Faculty Mentors for Undergraduates

As mentioned in the introduction to the mentoring section, we asked faculty, "Do you think that the Illinois Computer Science Department values student mentoring? Participants were asked to explain why they answered this question in the ways that they did. Many did so through the lens of the Faculty Mentor role which the departmental website describes in this way,

"All students are assigned a faculty mentor, with whom they must meet at least once each academic year, typically before April. The department enforces this requirement with a registration hold."

One faculty participant wrote,

"I hope the department does value student mentoring, but I am not familiar with the mentoring activities or how effective they are. The undergraduate advising is spotty – several students do not appear to meet with their advisors – and I suspect that less motivated or less organized students are falling between the cracks."

During the interviews, a faculty member said,

"I think, yes, we're encouraged to, especially advising graduate students. I've heard mixed things about working with undergraduates. I think some people say, 'Do not spend too much time on that.' While other people do it, and enjoy it."

During the interviews, another said this of the undergraduate students,

"They're required to meet us once a year for 20 or 30 minutes. It's hard to imagine that anything of significance can happen in that amount of time...They already have advisors to help them pick classes. So, at least the students I talked to, which hasn't been many – said they don't see the point...But for a mentorship to work, the student has to have a reasonable expectation that the faculty member actually knows them...And I don't see how that's going to happen without significant investment of time."

Yet another said,

"I hear third-hand that many faculty consider undergrad student mentoring a necessary evil but do not take the time to learn how to mentor well."

Faculty can be a great resource for a variety of mentoring needs. A student interested in a particular research domain can learn more about the domain and career opportunities from a faculty member. A student interested in learning about work-life integration challenges would benefit from hearing the challenges faced by faculty. All told, students benefit from positive faculty interactions.

The Faculty Mentor role comes from a place of good intent: increased interactions between students and faculty. However, the role – as described to students, as defined by the department, coupled with a registration hold – encourages students to meet with faculty on matters of curricula and course requirements, topics in which faculty cannot be expected to be experts. Students experience this role in this lopsided way. One undergraduate participant wrote,

"He or she can try to be as helpful as they can, but when it comes down to it, they really are only knowledgeable about their field and the courses they interact with. When it comes to more general CS classes...and classes outside of their field, they really are no more help to you than anyone else."

7 Transparency

While transparency issues have been discussed in part in the above sections, because it was so frequently raised in all three of our key demographic groups and has a large impact on cultural trust and belonging, we dedicate the following section to a variety of specific areas where transparency concerns were raised by our participants.

7.1 Undergraduate students

We have already described several transparency concerns in the above two sections: Students feeling unprepared for navigating problematic classroom experiences as teachers and peers; expressing confusion about the purpose of the Faculty Mentor and the difference between a Faculty Mentor and the Academic Advising Officer; and difficulties in determining course and career pathways. In addition to these, another frequently cited transparency issue among undergraduate students has to do with perceptions about failure and success. Most of the undergraduate students described intense worry about choosing the "right" area of focus, internships, order of courses, and more, with a fear that if they made the "wrong" choices, they would be unemployable. This was especially the case for first generation students, women, LGBTQ+ students, students of color, and international students, for whom the research shows a pressure to overprove themselves to demonstrate their worthiness in STEM fields [24, 22, 19, 26, 30, 8, 35]. As one first generation student shared with us in an interview,

"This topic has me so worried...There's this divide between students who came into computer science because of a curiosity. You know, they came in to start learning and then sort of make a career out of it, starting with college. But then there's a very different world of the students who had communities in their high school and from their parents who went to college in CS and engineering where they were working on projects and getting experience with crazy tools at a young age. So, I feel very behind. I didn't have that exposure and I'm learning the fundamentals, so I feel so far behind compared to all the students who already had that experience and who, because of that experience are getting the internships fresh out of freshman and sophomore year. That internship is so important to landing a job and I can't really even get an internship. How do I even catch up with that expectation?"

To explore this more deeply, we asked participants, "Do you consider yourself a typical computer scientist?" paired with an open-ended question that prompted students to share why they responded in the way they did. Figure 21 shows the responses to this question, disaggregated by a variety of different demographic groups. Roughly 62% of students reported that they do not consider themselves to be typical computer scientists. However, men, especially white, Asian and international men, were most likely to identify as typical computer scientists. Whereas gender minorities, white women, and underrepresented minority men were least likely to identify this way. As we explored the reasons behind this, gender and racialized social beliefs that can lead to a sense of exclusion from computing emerged, with frequently cited explanations for this sense of being atypical including gender, race, personal lives/lack of constantly programming and sacrificing all else, feeling like they don't fit in, not having a lifetime of programming experience before starting college, research interests, and having to work at it. The following quotes illustrate some of these common patterns, split by gender. Women and gender minorities tended to say the following kinds of statements:

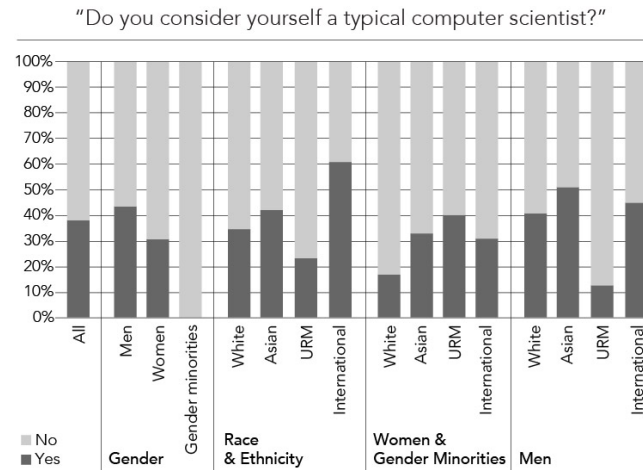


Figure 21: When asked, "Do you consider yourself a typical computer scientist", about 38% of all participants answered "Yes." Smaller proportions of women, gender minorities, and underrepresented minority students answered "Yes".

"As a woman I feel out of place a lot.

"Haha no - I'm a female minority. I hate video games. I don't even like CS anymore because I feel [mistreated] by my department."

"I consider myself atypical because I did not have a programming background prior to entering college."

While men, especially white, straight men, tended to say things like:

"I am a male, who enjoys video games and thinks he is smart...That's how most of us are and that's why the stereotypes have developed, such as a tendency towards introversion coffee."

"I'm a white guy, I'm pretty geeky, and I taught myself to program before I had any formal introduction to computer science."

In addition, one student who said no, described experiences in the department that were exclusionary because of the Hijab she wore. "I wish people would just ask me about it if they want to know, rather than avoiding me or whispering behind my back."

We also asked our participants about their sense of success in the department; see Figure 22 for responses. While nearly 91% of students reported feeling at least somewhat successful, feelings of success varied demographically with white and Asian men and white women more frequently saying yes; underrepresented minority men, international and Asian women and gender minorities more likely to report somewhat; and international men and underrepresented women and gender minorities most likely to say no.

Those who said yes were most often defining success in terms of grades, high competition internships, participation in the registered student organizations, and their own intelligence and innate ability, with women in this group referring to how much they have learned and what they have survived. Among those who reported no and somewhat, they attributed this to social issues, isolation, the ease with which their peers seem to complete coursework, and the expectations put forward by their peers and professors. Many in this group of respondents called out the registered student organizations as toxic and exclusionary, especially to already marginalized students.

As we looked deeper into reasons behind this, clear definitions of success emerged that led to a sense of exclusion and further marginalization for historically marginalized students. For example, students responded that they do not feel successful explained why like follows:

"I don't feel like I fit in socially to the department and constantly feel like an imposter who is just barely getting by."

"I feel incompetent seeing all my classmates land internships at high profile companies."

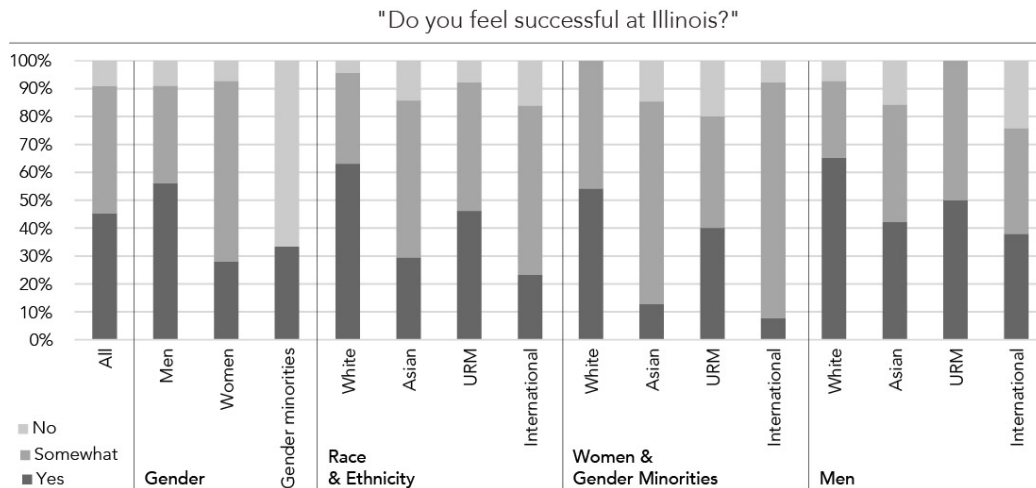


Figure 22: When asked, "Do you feel successful at Illinois?", nearly 91% of students reported feeling at least somewhat successful in 2017. Feelings of success, however, varied demographically.

"I almost feel like there's some people that I have to prove myself to before they even start taking me seriously as a person. Not even as a CS student."

While students with a high sense of success explained their success differently:

"On what it takes to succeed: Innate ability to problem-solve, a personality conducive to competition, a high degree of focus."

There appears to be a widespread cultural belief and messages that innate talent and intelligence are required to be successful and belong in computing. These traits create a parallel expectation that computing and coursework should come easily, with grades and high profile internships as the primary metrics for success. Innate talent and natural ability were more often claimed by white students, largely men, while women, gender minorities, and students of color judged themselves as lacking. Recent research [24] demonstrates that the extent to which a field attributes success to innate intelligence or brilliance accurately predicts the extent to which those fields struggle with diversity and inclusion issues because women and underrepresented minority students are stereotyped as not possessing such talent. Predicating success on natural brilliance not only creates dysfunctional and exclusionary social dynamics, but potentially discriminatory evaluation processes.

We are including these findings in the Transparency section of this report because these cultural messages hide and minimize the role of failure, support, and collaboration in innovative computing. As students and faculty members alike perpetuate the story of a perfect and individualistic pathway through computing education and career by leaving out stories of struggle, failure and the lessons learned from them and stories of support from parents, mentors, sponsors, networks, and more, the narrative further ostracizes students who encounter challenges and/or who do not fit the stereotype.

7.2 Graduate students

In addition to the transparency issues already mentioned in the Teaching and Mentoring Sections above (navigating problematic classroom experiences and finding mentors in the department), a number of other transparency concerns surfaced among graduate students. Here, we focus on the qualifying exam. The Ph.D. qualification exam is the first major milestone for doctoral graduate work in the Computer Science department. According to the department's public website,

*"The purpose of the Ph.D. Qualifying Exam is for students to convince the faculty that they should be considered a Ph.D. candidate. Faculty evaluate whether the student has the knowledge, experience, perspective, and determination to complete the Ph.D. program. In addition, faculty will evaluate the student's presentation and communication skills to ensure a mastery of English sufficient to teach in a U.S. institution can be achieved by the end of the Program."*¹

¹Source: <http://cs.illinois.edu/academics/graduate/phd-program/qualifying-exam>

During our survey of graduate students, we asked those at the Ph.D. level to explain in their own words the purpose of the qualifying exam. We received a variety of responses. While some students echoed the statement above, many others (about half of those who wrote in responses) pointed out differences between the intention and the actuality of the exam:

"It is 'intended' to be a way to measure a student's ability to be a productive researcher by assessing their background knowledge of their area of research and their ability to assess research work from that area. In practice, it feels a lot like hazing."

"It is to learn general knowledge of the research area. Often times it did seem like extended course exams, however."

"To weed out students who are a poor investment of an advisor's time and taxpayers' money. This also prevents a student from wasting further years of their life on something they will not be successful at."

Publicly, the department offers that the implementation of the exam may vary across research groups. According to our participants, it varies a great deal. Comprehensive written tests, oral presentation of assigned research papers, submission of an original manuscript, and unstructured interviews are all examples of how the exam is implemented across groups. For some students, the exam format selected by their research group was considered effective, efficient, and contributed to their professional development.

One interviewee described the recently revised format of her qualification exam, *"We need to just write a paper...about our own research."* She presented her work in a Q&A format to four professors in a committee. She said of the format, *"And I really liked it that it was to write a paper, rather than spending time doing course work that doesn't really help with the research. So I was really happy with the new style."*

She also described the kind of feedback she received after the exam, *"I got the paper reviews for each of the professors with all of the comments and I have to rewrite my paper. They were expecting things to be there that I didn't explain well. But it's rewriting a paper that I would potentially publish and I got reviews before actually publishing it."*

For this student, the exam format was an opportunity to receive feedback on her research, writing, and scientific communication skills and helped her strengthen her work. She was being asked to complete a task she would need to do well to complete her Ph.D.: write research papers. In the process, she interacted with four professors, discussing her own research, two years into her degree. Moreover, she received high-quality written feedback similar to what she would receive on her future scholarly works, even after graduation. She said, *"The best part was it was about my research so whenever I go back to [the committee's] questions, I feel like there was an improvement or new ideas about my own work, which is the most important thing about research."*

About half of the doctoral students who had already taken the qualifying exam at the time of completing the survey echoed this participant's satisfaction with the process and quality of feedback received. The other half of respondents, however, did not experience quality interactions with faculty through their qualification exams. For example, one student described his format as a written exam based on a reading list. He said, *"'You passed' was my feedback. Never got to see my exam. Never got any detailed opinion of what things I was good at, what things I should improve on. Which papers I did better at, which ones I didn't do as good at."* This student expressed a strong desire to have the opportunity to reflect on his strengths and weaknesses and felt that the lack of feedback served as a barrier to being as successful as possible. From his perspective, even though he passed, the exam did not contribute to his professional development nor did it allow for meaningful engagement with his research group advisor or faculty committee members.

Another student, who also took a written exam, received a conditional pass. She said, *"The thing is, like they don't tell us how we passed. I just got [word] that I passed on the condition that I have a research paper submitted by the end of next semester. But there's nothing that says you did well on the written part, but you didn't do well on this part. Or you did well on this part on part but you didn't do well on this specific question."* Like the previous student, she sought a deeper understanding of skills so that she could work to improve upon them and expected that the qualification exam would present her with that opportunity from faculty feedback.

Given that this is the first of only three milestones in the Computer Science Ph.D., it is concerning that students are not receiving quality feedback. It is a missed opportunity for greater interactions between students and faculty in the department that have a direct impact on the students' success. The qualification exam is a moment that can provide students with quality professional feedback and direct mentoring that would aid in their development.

An area of even greater concern is how implementation of the exam can differ for students from different demographics even within the same research group. We interviewed two graduate students from the same research group comprised of about 10 tenure-track faculty members. From a policy transparency, implementation, and equity perspective, interviews with these two students stood out.

In both cases, the students were offered a two-part exam. In the first part, the group's faculty offered a standard reading list three months before a closed-book written exam was administered. The purpose of the written exam was to assess student knowledge of the research area's fundamental topics.

The second part of the exam was described in this way by a white doctoral student,

"There was a verbal part, but basically, my understanding of what that was for was purely just to evaluate your English speaking skills. It was like, meet with a faculty member and talk about your research for like ten minutes."

When asked how many meetings, the student replied, that he was supposed to have three independent meetings, and that, *"I think I ended up having two instead of three. Because one person was just not available."*

The same exam was described by an underrepresented woman of color,

"Part of my qualifying exam is taking the written exam and then basically going to each and every one of the [group's] faculty and having a 10 to 15 minute interview which covers absolutely nothing."

This student also described bias and assumptions in her day-to-day interactions with faculty and students, particularly around language:

"I'm American and I'm also [race]. I know how to speak English very, very well. It's my first language. I also know how to speak [another language] very, very well. I'm a bilingual. But they never dare to ask. And I feel like its ok. Don't be too afraid to ask, you know. As long as like, you're asking honestly and not trying to, you know . . . I don't know. There is an honest way of asking a question. And then there is a way where you're like just looking for a fight."

Both students in this research group separately described unwritten evaluation criteria for the verbal part of the exam that made them both feel uncomfortable because of the ways these criteria target international students and students presumed to be non-native English speakers. Both also expressed the sense that this portion of the exam was providing no feedback and serving no larger purpose in the evaluation of their research skills.

We also asked students: *"Having taken the qualification exam, do you feel prepared to proceed as a researcher?"* Only 31% of the doctoral students who responded to this question said, "Yes" about an exam intended, in part, to assess their capacities to continue as doctoral researchers. Respondents who replied with "No" or "Somewhat" provided some additional insights, saying:

"It was basically assessing whether I had taken the department-offered courses in the subjects that were covered. That doesn't assess whether I can be a productive researcher."

"My qual did not focus on my research area, and felt more like a waste of time than help."

"While I feel that I have a good background, I do not know if I am well-prepared to apply the background."

"I guess I got some practice writing?"

"After this year's quals, (students a year behind me), I am especially left with the impression that whether one passes or fails is pretty random. The student who seemed most prepared in the practice quals we did was the one who I believe failed. All the practice in the world can't prepare you if one of the faculty asks a super hard question out of left field that you weren't prepared for. I, on the other hand, seemed to have been given very easy questions and I am often dogged by the suspicion that the faculty had already decided before the qual that they were going to pass me."

Taken together, this collective input from doctoral students demonstrates that the lack of transparency about the qualifying exam's structure and evaluation process, even within the same research group, created a sense of mistrust among a significant set of students, regardless of the outcome of their own exams. The sense of inequity and mistrust in the process even led to students who passed doubting their own capacities as doctoral candidates.

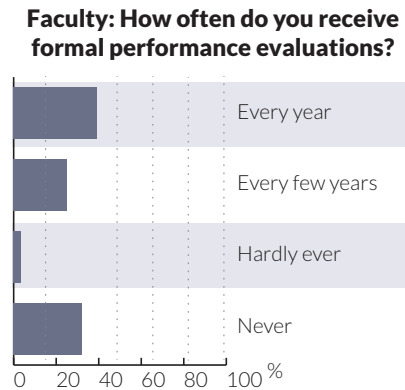


Figure 23: Faculty were asked about how often they receive performance reviews. More than 32% reported that they have never received a formal performance evaluation.

7.3 Faculty

"With a little bit of effort, the department could make things better. Just making some of these procedures more transparent would be helpful. For whatever: teaching assignments, space allocation, salary increases, whatever else is being done - Just saying what it is they're looking at and how they're doing that. Just write the rules down. The rules are never going to be very precise, but at least you know to some degree what is being done."

In addition to asking about teaching and mentoring in our survey of faculty, we also asked a number of questions about performance evaluations and workload. Most faculty members said that their roles, expectations, and responsibilities were communicated to them in their offer letters, but in a very general way that stated a percentage breakdown of their time among some combination of research, teaching, and/or service. Tenure track faculty members told us that there is an unwritten assumption that the teaching, research, and service responsibilities are similar across all of academia and it is expected that, in joining the faculty at Illinois, they should know this without being told or having it in writing. Each of our faculty interviewees expressed frustration that there is no written promotion and tenure policy in the department and that word of mouth was the primary way faculty learned about which activities are most valuable for promotion.

For example, junior tenure track faculty member explained that he was not aware of any written expectations of preparing a tenure package or how to earn tenure. He felt that he had a reasonable sense of expectations because he had spoken to colleagues at several other universities during his interview but was not provided with written guidelines on the promotion and tenure process in his offer letter or after accepting the offer. His colleagues did not give clear information verbally either, so he felt alone in trying to navigate the process. Several faculty members told us that the promises and expectations communicated to them during the interview process did not actually happen after the hire. One told us,

"Mentorship was promised, but was not provided. Course releases were promised, but the more senior faculty didn't want to teach the big undergraduate courses, and so I ended up teaching a 1:1 in the first year."

This lack of transparency and follow-through about expectations, workload, and promotion pathways can lead to actual and perceived inequities in the department.

While many of our respondents told us that annual performance reviews were the spoken norm in the department, these reviews seem to happen unevenly and largely based on self-evaluation when they occur. As shown in Figure 23, more than 32% of faculty members reported that they have never received a formal performance evaluation. In addition, as shown in Figure 24, only 3.6% of our respondents who have received performance evaluations described them as "very effective". One interviewee described the process as follows,

"Faculty write up what they did that year - teaching, service, research. There's not much incentive to create that document - it's just a ritual - it's just used to decide salaries. Sometimes I skip it. It is not helpful and doesn't really contribute to my professional growth."

Another expressed frustration about not really knowing what counts for teaching evaluation, explaining that it seems to be "butts in seats" and sometimes "ICES scores" but otherwise, the rules are unclear: *"nobody said... and even to this*

Faculty: How effective is the feedback you received regarding job performance during your time in the Illinois Computer Science department?

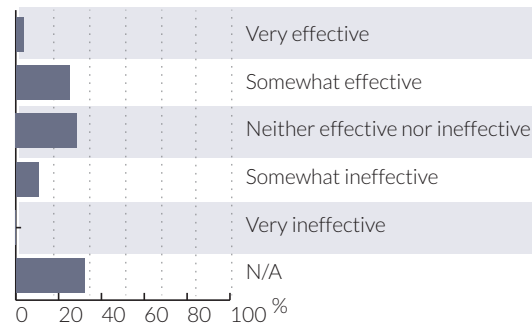


Figure 24: Faculty were asked about the effectiveness of their performance reviews. Only 3.6% of our respondents who have received performance evaluations described them as “very effective”.

day nobody says exclusively, oh we’re just counting butts in the seats. You just simply figure that out from the informal annual evaluation.”

Faculty participants answered a series of questions about their workload, including a comparison to their perceptions about their peers’ workloads, broken out by research, teaching, and service roles. Figure 25 summarizes the results. Overall, between 48% and 58% of faculty members perceive their workloads in these areas to be comparable to their peers. However, the largest gap in equitable workload distribution appears in faculty service, where roughly 41% of our respondents said that they have greater service responsibilities than their peers. In addition, 83% of the women and minority faculty in our sample felt this way. Among the 26% of participants who reported greater teaching responsibilities than their peers, nearly half were women and minority faculty. Given the uneven social role expectations placed on women and minority faculty to engage in service work, especially diversity, inclusion, and mentoring work [2], this is an area of concern, especially when service is seen as the least valuable activity in the department. One participant explained how a lack of transparency creates a sense of inequity in decision making about many aspects of faculty work:

“Teaching assignments, definitely. How, you know, senior vs junior professors get it; who has how much choice; who they kept the choice for. Space allocation, in terms of where students sit, where the faculty sit; who has lab, who doesn’t have lab. Um, service, again, in terms of who serves on what committee. Who doesn’t...Administrative support, again, who gets more or less. Research – I guess you should do research on your own, but again, there are gaps even there.”

Faculty members who have had performance evaluations explained that service activities rarely factored in, if at all. Many explained that they have no idea how their service work is being assessed. One participant who discussed his service activities during his evaluations explained that *“They are considered along with my research and teaching, but UIUC generally gives more importance to research and teaching than to service.”* Another told us that service work evaluation functions more like a check box where she shares her work *“largely informally, based on self-reporting on my CV and annual evaluation form, plus personal interaction with department head and other faculty in the course of committee duties.”* A full professor described the lack of quality feedback or recognition of teaching or service activities, saying that the lack of value attributed to these activities influenced his withdrawal from multiple service duties now that he’s full professor. Another told us,

“I currently have no service obligations. However, the few things I helped with, I found it’s up to the people involved to actually care; the department culture seems to let lots of people get away with not caring.”

The faculty who care, this participant explained, are often overtaxed by carrying more than their fair share of the service load, especially service within the department. As one participant explained, *“I believe I have a reasonable load currently, and some of my colleagues are simply overworked.”*

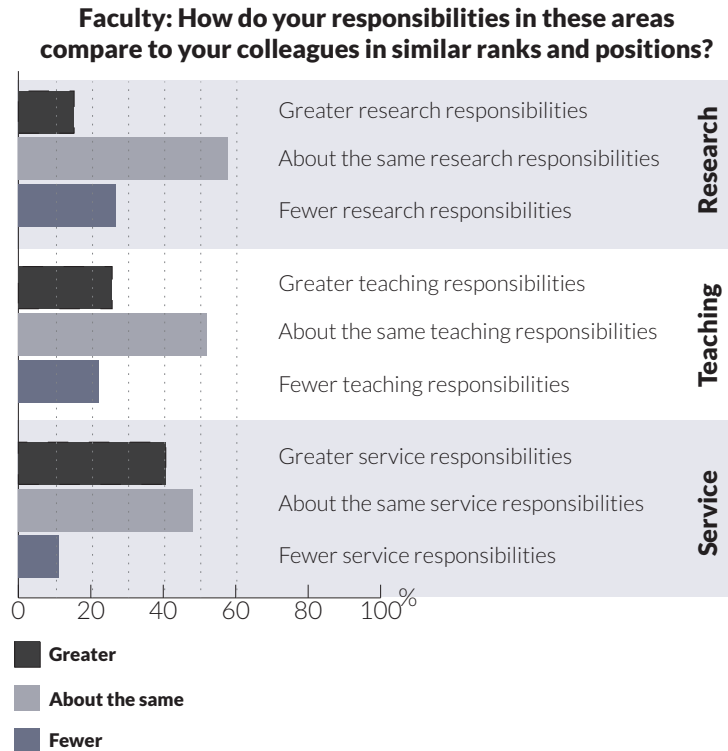


Figure 25: Faculty participants answered a series of questions about their workload, including a comparison to their perceptions about their peers' workloads, broken out by research, teaching, and service roles.

7.3.1 Family Leave and Work-Life Issues

Even though 92% of our respondents have children of varying ages or are caring for elderly parents, roughly a third of the faculty members we surveyed were unaware of the department's family leave policy and many of those who were aware that the policy exists were either dissatisfied with the coverage for their current or past needs or were unsure as to whether the coverage would meet their future needs. We even received some comments expressing concerns about covering the responsibilities of faculty members who take leave. For example, one respondent said, *"I think it's hard to implement the leave policy by finding a substitute teacher"* and described a stigma attached the policy, especially for women. Another told us, *"I have seen many new parents being misled, or asked to combine other entitled leaves (e.g. the incoming semester off) to cover for FMLA."* A third respondent explained, *"The general thought is that you shouldn't request leave for the birth of a child. It is not at all encouraged."* Another faculty member who is a father told us, *"I cannot think of one way the Department was supportive of my role as a parent. Despite having two young children, I recall the Head at the time asking solely about my research productivity during the annual evaluation. He seemed surprised when I explained that my productivity was reduced due to having two young children."* Others called out the different work-life issues for households with two working parents. For example, one participant said, *"I think there is a big life difference between a faculty with a stay-at-home spouse and a faculty member with a working spouse. Potentially hard for the former category to understand the lifestyle of the latter category."* Several faculty respondents contextualized this issue as part of a larger work-life integration struggle within the department. For example, one person told us,

I made a decision – and I do not regret my decision – that I would split my life between trying to be a responsible parent to my children, and at the same time trying to be an active and engaged researcher and instructor. And the fact that there is no structure that accommodates people who have significant periods of their life where they have altered life circumstances, where they can not devote 100% of ... the fact that we demand that people devote 100% of their lives to their work. They can take, you know, their down time when they're too tired to do their work, to fix dinner and goof off; or maybe do a little bit of housework. But basically, all of their time, when, you know, they've got active energy, is supposed to be poured into thinking about and doing their work, in order to be able to be the best researcher; in order to get the accolades to be able to keep getting the things that they want. The fact

that we don't have any method for allowing people to be respected and still have chances to later move up the ladder; while still having a significant portion carved out for down time, I believe is a diversity problem; and one that hits women and minorities especially hard. Because they are more likely to have life circumstances to split their attention. And there is no provision for that. There is no desire to have a provision for that.

8 Recommendations

Fostering a sense of belonging in computing cannot occur solely through ad-hoc methods. A suite of policies and structures must be put into place to create belonging in all aspects of departmental culture. While there have been significant departmental improvements in the past decade at the University of Illinois at Urbana-Champaign, there remain cultural, policy, and structural issues to be addressed to develop belonging and success of all students and faculty, especially in light of the increasing growth of the department. The greatest success story uncovered in our study is in the positive shift in undergraduate perceptions of teaching excellence in the department. In our view, this emerged from a coherent set of policies, structures, and financial investments that incentivized quality teaching in the department. These were

- A formal teaching requirement for all Ph.D. students.
- Significant improvements in undergraduate advising policies, including two full time student-facing academic professionals.
- Investment in formalized teaching track faculty.

It was an intentional approach.

In a recent report from the National Academies Press [31], intentionality was defined in the following way,

"The committee defines intentionality as a calculated and coordinated method of engagement by institutions, agencies, organizations, and private investors to effectively meet the needs of a designated population within a given higher education institution. Intentionality in this context translates to the creation of tailored initiatives, policies and practices that meet students where they are in their college careers academically, financially, and socially, while doing so with cultural mindfulness that moves students toward higher levels of academic achievement and self-confidence."

This intentionality – a deliberate focus on what works to improve departmental culture in terms of teaching, mentoring, and transparency – is the common thread to our recommendations.

8.1 Recommendations on Teaching and Learning Environments

In large part, the survey of undergraduate and graduate students in the department shows that the changes made since our 2006 survey have largely yielded positive results. Major changes such as an investment in teaching track faculty, the inclusion of more extensive TA training, and increased flexibility in coursework at the Ph.D. level have led to greater satisfaction among students at all levels. Both masters and Ph.D. students are significantly more positive regarding how well their required courses have prepared them for future work or research, and undergraduates are very positive about the teaching track faculty and largely feel that their instructors are preparing them well and are invested in their success.

However, there are several changes which could improve the landscape for instructors in the department at all levels. Even though the department's policy currently requires teaching assistants attendance in TA training seminar, attendance in this course does not seem evenly enforced, fueling gaps in preparedness as well as inequities among graduate students. In addition, the CS591 TA course does not include modules on how to manage students in crisis or handle classroom difficulties. We recommend extending the course to include a discussion of available resources such as the campus mental health center, as well a module on how to manage difficult classroom situations. In addition, having a similar training for undergraduate CA's would also benefit their readiness for teaching roles and ability to navigate problematic behaviors that surface in the classroom. Fifty-two percent of the faculty members and 59% of the combined student body responding to our survey indicated that they have witnessed inappropriate behavior or heard inappropriate comments in the department. Among the graduate and undergraduate students, 86% of those who responded this way were students from a variety of marginalized backgrounds, including women, gender and sexual minorities, students of color, and international students. For all demographics in the department - including students, faculty, and staff alike - peer and bystander intervention training are warranted given the number of stories participants shared with us about exclusionary behaviors, including implicit and explicit bias, microaggressions, and forms of identity-based harassment and violence, they have directly experienced or witnessed.

Finally, faculty members expressed much frustration with teaching. Many faculty members feel there are no departmental resources available to help improve their teaching and there is a lack of transparency and fairness in how course assignments and evaluations are conducted. While faculty do have access to some resources through the Center for Innovation in Teaching and Learning, many are unaware of this or do not feel that it is worth their time because of competing incentives for other components of their work, like research. We recommend building incentives that

encourage faculty to take advantage of these existing resources, and reward them in terms of workload and evaluation when they do. In addition, the department could create a support group for those interested in teaching-focused discussions, particularly among junior faculty. It seems clear that annual reviews do a poor job of evaluating the complexity of time investment in teaching. This process should be revised to incorporate more than simply number of students and average teaching scores from student reviews. Teaching assignments are a major issue in some research groups, with a sense of inequity pervading how faculty perceive the assignment process; clearer metrics for how teaching loads are assigned and balanced is also an obvious place for improvement.

8.2 Recommendations on Mentoring

Despite the department's efforts to improve faculty and undergraduate student interactions and improve undergraduate student mentoring through the Faculty Mentor assignment and the addition of two full time student-facing academic professionals in the Academic Advising Office, the Faculty Mentor role was clearly not successful for the faculty or students involved. Comments from undergraduate students and faculty members suggest that students found it at times to be a harmful, bureaucratic hurdle and faculty found it burdensome. This is undoubtedly exacerbated by increasing class sizes at the undergraduate level. As bridges to computing research, educational, and role-modeling experiences, student interactions with tenure-track faculty are influential in fostering a sense of belonging, success, and future career opportunities and possibilities. That these interactions are often negative, particularly for marginalized groups, raises concerns about departmental and field-level retention issues. Part of the issue with the Faculty Mentoring program is that it was not as intentionally invested in as were efforts to improve teaching. Instead, the program was framed as part of a revision to undergraduate advising policies, positioning it as an advising activity rather than a mentoring relationship. In addition, graduate students and faculty members who were assigned mentors offered similar complaints about the effectiveness of these mentoring relationships and instead, relied more on peers and colleagues outside of the department to meet their needs. To revise the Faculty Mentor program and other mentor assignments to help them more intentionally meet the intended goals, we recommend the following training and structural efforts.

8.2.1 Training

We want to recognize that faculty members do not automatically know how to serve as effective mentors. Additional professional development for faculty members in these areas combined with a matching reward structure that values these aspects of faculty work would greatly improve the culture for students and faculty. Similarly, guidance for students and faculty alike on how to make the most of their mentoring relationships, how these relationships can contribute to their careers, and how to engage effectively as a mentee would also help shift the attitude that mentoring is a bureaucratic task. Beyond advising and informational roles, effective mentoring relationships should also offer students educational, career, and psychosocial support and access to additional professional development opportunities. These relationships should be structured in a way that the mentor experiences value from participating as well [16]. Faculty members' mentors should provide them with parallel benefits, serving as key resources for professional and psychosocial support and offering a greater sense of connectedness within the department to both mentors and mentees. Clearly communicating the roles and expectations of mentors and mentees, the program structure, and the benefits of engaging in effective mentoring relationships are all key components of mentoring education.

8.2.2 Interest-Based Cohorts and Collective Mentoring

We recommend transitioning from one-to-one pairings to a cohort system based on areas of expertise and interest (i.e. machine learning, AI, etc.) that can be facilitated through activities such as group luncheons and other informal activities. This will work with the tight schedule of faculty members, build learning and professional development communities, foster collaborative experiences, and begin mentor-mentee relationships on shared interest rather than a requirement. Mentees will be incentivized to connect with their mentors because of a subject-matter interest and the peer network they can build and, because they better understand how to navigate the mentoring relationship through their training, fewer barriers will prevent them from accessing their mentors and peer groups. Mentors will be incentivized to share their expertise and experiences more holistically with their mentees because of the training and the cultural shift that rewards and values mentoring activities. A goal of this program should be to humanize both parties and allow them a space to develop insight about their futures free from their other academic and workplace pressures. Moreover, creating mentoring teams allows for the mentoring "labor" to be distributed and is a more effective form of mentoring as no single mentor can fulfill the diverse mentoring needs of another individual [1, 12, 37].

8.3 Recommendations on Transparency

While we raised transparency as an issue during the 2006 study, new findings from the 2017 wave provide additional insights on specific areas where the department can reduce opacity, improve the implementation of its policies and

programs, and create greater trust across all segments of its community. First, shifting the narrative about what it takes to succeed in the department and in the field by sharing stories not just of clear successes, but also of the failures and pitfalls that happened along the way will create a more realistic and transparent picture of pathways through computing. To shift this belief, departmental leadership, faculty, and staff should transition away from emphasizing talk of innate giftedness and instead focus on the importance of sustained effort, even highlighting the valuable lessons learned from "failing" or grappling with difficult problems in their own lives. This includes sharing more openly sources of support and collaboration key figures in the department have had throughout their careers. These counter-stories can be told as part of mentoring relationships, in the classroom narrative, in seminars about failure and collaboration, and more. Sharing a more holistic view of what it looks like to engage in computing work allows students and faculty to better relate to one another and to the field and to have permission to show up more authentically in the work they do.

Second, the department should work toward documenting its processes, programs, and policies for students and faculty. This includes not just course requirements, but also mentoring programs, evaluation criteria, pathways to promotion and tenure, key resources for dealing with crisis and problematic behavior, workload assignments, performance feedback, qualifying exams, assistantship assignments, space allocation, and more. Writing down the rules and sharing them openly creates greater equity and trust in the department. This does not mean everything has to be rigid or one-size-fits-all, but creating a basic rule set and building accountability for following that rule set can go a long way.

Third, the department should revise its feedback mechanisms for graduate students and faculty to create a process that contributes more substantially to the professional development of each and better aligns with the purpose of the evaluation. These mechanisms should be used consistently and applied evenly across the graduate student and faculty communities. For both graduate students and faculty who have received feedback, many find it unhelpful and experience it as additional busy work or hoop jumping they have to endure with no real benefit to their growth. This wastes their time and the time of those doing the evaluation. Creating a clearer, more efficient, consistent, and aligned process will benefit everyone involved.

Appendix A Undergraduate Mentoring Topics

List of mentoring topics supplied to undergraduates, in order of most-selected to least-selected.

1. Degree requirements and assessing progress.
2. Planning a course schedule.
3. Getting into a closed course.
4. Anticipating workload of various computer science courses.
5. Possible career paths.
6. Understanding the various areas of computer science specialization.
7. Understanding academic policies and procedures.
8. Getting into graduate school.
9. Survival tips for specific courses.
10. Getting letters of recommendation.
11. Finding employment and volunteer opportunities to get relevant work experience.
12. Day-to-day struggles with college.
13. Anticipating teaching styles of various faculty.
14. Choosing social science and humanities electives.
15. Getting help with resume writing and interview preparation.
16. Getting academic support, e.g, tutoring.
17. Transferring coursework from other institutions.
18. Worries about fitting in.
19. Finding employment, scholarships, or financial aid to help pay for school.
20. Other. Please explain:
21. International student paperwork.
22. Interpersonal issues you are experiencing within the department.
23. What to do when someone makes unwelcome comments, jokes, or gestures to you or about you.

Appendix B Graduate Mentoring Topics

List of mentoring topics supplied to graduates, in order of most-selected to least-selected.

1. Getting feedback or guidance on academic writing.
2. Learning about the suggested background reading for my research area.
3. Getting letters of recommendation.
4. Choosing courses that provide a solid background to conduct research.
5. Getting feedback or guidance on presentation and public speaking skills.
6. Degree requirements and assessing progress.
7. Understanding academic policies and procedures (e.g., rules on taking the qualification exam, scheduling a preliminary exam or defense).
8. Choosing a committee.
9. Getting mentoring on careers in academia.
10. Getting academic support.
11. Organizing conference travel.
12. Day-to-day struggles with graduate school..
13. Understanding the various areas of computer science specialization.
14. Getting mentoring on careers outside of academia.
15. Anticipating workload of various computer science courses.
16. Balancing work and personal life responsibilities.
17. Anticipating teaching styles of various faculty.
18. Finding employment opportunities to get relevant work experience.
19. How to network and grow a community of contacts.
20. Advice on teaching assistant duties.
21. Finding employment for myself and my partner after graduation.
22. Choosing electives and/or a graduate minor.
23. Survival tips for specific courses.
24. Getting help with resume or C.V. writing and interview preparation.
25. Worries about fitting in.
26. Interpersonal issues you are experiencing within the department.
27. Advice on which courses might be valuable to work as a teaching assistant.
28. International student paperwork.
29. What to do when someone makes unwelcome comments, jokes or gestures to you or about you.
30. Other. Please explain:
31. Finding employment, or other financial aid to help pay for school.
32. Transferring coursework from another institution.

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