Yes, There’s a Problem (But Not) Here: Some Facts of Disparate Participation in Undergraduate Computer Science

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Yes, There’s a Problem (But Not) Here: Some Facts of Disparate Participation in Undergraduate Computer Science

Abstract

Despite increasing attention, the existence of gender inequality in STEM education and STEM professions remains an integral part of the status quo. This manuscript reports on interventions to incorporate professional morality and ethics into undergraduate Computer Science (CS) education, and associated research parallel to these interventions, as a part of an NSF funded project to ‘revolutionize’ CS education. Here we focus on findings of a set of repeated interviews with undergraduate CS students following an introductory ‘Foundational Values’ course centered around the topics of social justice and ethics.

This research provides evidence that a high proportion of students acknowledge the personal and professional value of ensuring diversity, inclusion, and social justice in CS education and professional practice. They are also able to successfully identify root causes of inequality, bias, and social injustices in CS contexts. However CS students demonstrate a social darwinist ideology that hinges on meritocratic fallacies as a consequence of the normalized white male dominance of the field that feeds off of homophilous peer network formations. They will commonly deflect or deny the existence of gender-based and other biases and sex-based gaps in capacity or initiative by referencing popular tropes including oblique references to what is right and wrong or through varying suggestions that diversity is not a problematic issue around them.
Yes, There’s a Problem (But Not) Here: Some Facts of Disparate Participation in Undergraduate Computer Science

There have been reports of many instances of gender inequality in social media, the popular press, and academic literature. One area commonly named in these reports is in STEM education and STEM professions. Similarly, there have been many reports of initiatives by major corporations and business groups to address these episodes. While companies like Google, Facebook, and Microsoft admit to disparity in participation of women and non-white or non-Asian males in technology industries, and claim to be pursuing many means to effect changes, there has been virtually no durable evidence of change.²

Within this, corporate and governmental organizations have become active offering incentives to higher education and other entities to take steps to address the disparity in participation by women and members of other underrepresented groups.³ We report on a program to incorporate professional morality and ethics into undergraduate Computer Science (CS) education, and associated research parallel to these interventions.

We provide evidence that a high proportion of students acknowledge the personal and professional value of ensuring diversity, inclusion, and social justice in CS education and professional practice. We also find that students can successfully identify root causes of inequality, bias, and social injustices in CS contexts. However, our data shows that when students are separated from guidance and leadership in support of diversity, inclusion, and social justice, they reflect a Social Darwinist ideology hinging on fallacies supporting normalized white male dominance that feeds off of peer network formations. They commonly deflect or deny existence of gender-based and other biases and gaps in capacity or initiative by referencing popular tropes and suggestions that diversity is not a problematic issue around them.

REVIEW OF RELATED LITERATURE

² [https://www.nsf.gov/statistics/2017/nsf17310/]
Gender Disparity in Higher Ed/STEM/CS

Compared to studies on the gender gap in STEM fields such as engineering, studies of gender disparity in CS education and CS professions are relatively scant. However, literature that focuses on other technological fields provides insight into social processes behind it. For instance, Ricco and Ohland (2012) discovered hierarchies of access to certain interactions with students in engineering education. Their major findings include students’ false concept of “real” engineering, students not considering effects beyond engineering, and belief the word diversity had been “tainted” by previous teachings. This poses a problem when trying to incorporate social justice into CS curricula as students are resist challenging existing conditions of the discipline.

Similarly, Tyler (2018) explicates the unseen contradictions at the base of inclusion: “organizational life exploits our need for recognition” (p. 17) and often results in social, administrative, and organizational structures that promote and emphasize differences such as productivity and quality in independent as opposed to collaborative efforts. Differences between individuals — for example, male or female — that do not cause differences in productivity or quality can be seen as somehow ‘objective’ reasons for practices that fight against inclusivity (see Ceci, Williams, & Barnett, 2009). This manuscript offers a different approach to inclusion and lack of inclusion in Computer Science education that focuses on micro and meso forces, and strays from an investigation of ‘inclusion’ in its organizational and administrative forms.

Mahoney (2001) explains that computing started out dominated by women as the work was viewed as clerical. In exploring how it became male-dominated, he offers two possibilities: women made room for men returning from war or men realized programming was a “challenging, creative intellectual enterprise that promised rewards and reputation” (P. 170).

Lorber (1993) explains how technology itself can construct gendered skills. Simply by engaging with technology -- or socialized and gendered ‘meaning’ of technology -- women come to be assigned a role of ‘user’ as opposed to ‘creator’ (Baker 1964; Lorber 1993).

Jacobs (1996) found women are increasingly disadvantaged at each step on the educational process
and ‘precollege socialization’ maintains sex typing of fields of study at universities.

van den Brink and Stobbe (2009) use the ‘paradox of visibility’ to explain why women in male-dominated fields communicate that they experience equality while they actually endure and recognize inequality. The women who do progress through the male-dominated STEM disciplines and workplaces are tokenized and put on display as exemplars of inclusion and diversity. While women are made visible in contrast to the greater population of men, they are still less employable than men and are caught in the “paradox of visibility” (van den Brink and Stobbe 2009). While their token status increases visibility as women, they decrease their viability as practitioners of their discipline when they assimilate to the disparate gendered culture by adhering to hegemonic norms and expectations (Seron et al. 2018).

Alfrey and Twine (2017) investigate how white and Asian women navigate male-dominated workplace as female professionals. By using an intersectional analysis, they determined that racially-dominant, LGBTQ+ and genderfluid identifying women in technical industries experienced a greater sense of belonging in the workplace. Those who conform to the “industry-specific norm of masculinity” (P. 45) are able to evade sexist microaggressions primarily due to their nonconformity to gendered norms. Seron et al. (2018) deduce female engineers ascribe meritocracy and individualism to success and discount their marginal status. Female students are encouraged to eclipse femininity with masculinity as they are socialized into cultures of male-dominated fields (Seron et al. 2018).

*Peer Network Formation*

People form connections and networks through similarity. This is a concept known as homophily. Similar people will have contact with each other more often than non-similar people, and similarity can be based on many different structures. Homophily also occurs through geography, since those individuals will be in contact often. Homophily has two types: status homophily and value homophily. Homophily also creates strong divides in our personal lives, shaping information we receive, our attitudes, and how we experience interactions (McPherson, Smith-Lovin, and Cook 2001). In our data we find examples of how students form around particular experiences and values taken in those experiences.
However, *some* similarity is not enough to create actual homophilous social networks. It is often thought that bringing together students with a common interest will create diverse friendship networks. Nuances and differences of opinions can be spread through social networks of homophilous groups, which can create a contentious divide between those groups (Stark and Flache 2012). As will be seen, such divides are readily activated at the personal and small-group levels and end up producing sub-groups that members consider to be more supportive of their unique interests and needs, and which may inhibit inclusivity — people identify and activate differences in varying ways for their unique purposes.

Cozza (2011) reviews literature based on mentorship in technology, and importance of female-to-female mentoring for women in the early stages of their STEM career path. Cozza suggests e-mentoring may be a tool to overcome some of the hurdles in getting mentor-protege relationships for women. Role models are thus considered to be an important feature of an environment that aims to increase participation of historically under-represented groups. As we will see, in the absence of such mentorships, peer networks can form around the fact of ‘under-representativeness’ for individuals in a disparate population such that members might ‘bootstrap’ their own internal mentoring and support system.

We see peer network formation is something that has particular features and results in networks that are commonsensically unsurprising. However, network formation is largely at the discretion of individuals in those groups, and not something necessarily under control of administrative planning. As a result, wishes of administrative authority (for example, a desire to promote inclusion and diversity) may not be fulfilled when individuals under that authority perceive their best options to exist in a narrower, rather than a broader, social network. We describe how this happens in several different ways, below.

According to De Grove (2014), friendships commonly form around digital games. This was also found to be a common thread in our research. De Grove’s work states that nearly all young individuals who play digital games also talk about games to “offline” friends. Despite the fact that two-thirds of De Grove’s participants were male, findings showed that the discussions were not gendered, meaning that males and females who play games talked about them equally, and in mixed-gender groups. However, this changes
when De Grove looks at which networks actually play games together. Only 69% of networks that talk about games together also play games together, and this particular association is highly gendered. It was found that the more girls or women were in a group, the less likely the networks were to actually play digital games together. As a result, while gaming is inclusive in some ways, it is not necessarily inclusive across the full range of possibilities, and it is a well-known phenomena that games provide a venue in which gender biases and harassment are expressed and even promoted, perhaps because of the boundaries De Grove (2014) notes in inclusivity (Fox and Tang 2017; Massanari 2017).

Looking Forward

In our project, BSU CS undertakes an initiative to improve diversity, inclusion, and social justice, aimed primarily at increasing participation and retention of women and other underrepresented groups (i.e., anyone except white and Asian males). Some successes can be reported, but here we focus on how these aims are made more tricky due to socialized and stereotyped norms that students bring with them and perform in their student roles. In some ways this effort is aided through actions by the department and students that focus on ‘increasing diversity and inclusion,’ and in other ways this focus is actually seen by students to produce a conflict that they problematize and sometimes block.

ATTEMPTING TO INFLUENCE INCLUSION, DIVERSITY, AND SOCIAL JUSTICE THROUGH CURRICULAR REVOLUTION IN COMPUTER SCIENCE EDUCATION

Our research focused on experiences of undergraduate C) students at Boise State University (BSU CS) during the period fall 2017-fall 2018. Our data come from interviews with students following their first course in CS: CS-HU 130 ‘Foundational Values’. CS-HU 130 is a one-credit course required of all students in the BSU CS undergraduate program, and part of a project sponsored by the National Science Foundation ‘RED’ program — Revolutionizing Engineering and Computer Science Departments. Our project is titled the Computer Science Professional’s Hatchery (CSP-Hatchery) in reference to a legacy industry of fish hatcheries in Idaho. Analogous to a fish hatchery, in the CSP-Hatchery we aim to:
Approximate ideal-typical elements of a software startup company as it supports agile development of curricular resources to meet extant needs both internal to the organization (BSU CS) and for the needs of local industries employing computer science graduates.

Provide curriculum-wide learning and performance innovations in support of improvements to diversity, inclusion, and social justice in computer science education, that can be translated into ‘the wild’ of computer science professional practice.

An element of this is the creation of a new category of courses, so-called ‘hatchery units’ — one-credit courses designated with CS-HU prefix. Regardless their technical content and curricular goals, CS-HU courses contain elements that support diversity, inclusion, and social justice in computer science education and professional practice.

As indicated, the first ‘hatchery unit’ students undertake when they enter BSU CS is CS-HU 130, ‘Foundational Values.’ Among other things, CS-HU 130 students encounter three case examples from the context of ‘newspaper sociology’ to demonstrate breaches of inclusion, diversity, and social justice in computer science work, and in products of computer science. Students use a rubric based on Rawls’ ‘Theory of Justice’ (Rawls 1999) to (a) identify moral and ethical problems identified in each case, (b) identify personal, professional, and business-oriented rights and duties to be fulfilled by stakeholders in each case, (c) prepare an ‘elevator speech’ type statement arguing personal, professional, and business-oriented support for their proposal, and (d) propose a unified set of rules, material incentives and material disincentives to pull and push stakeholders to fulfill the listed rights and duties.

4At present these cases are built around (a) a blog post by Susan Fowler, detailing her experiences during one year as an engineer at UBER (Fowler 2017), (b) a machine learning system used in the criminal justice system that had been shown to be systematically biased against African American individuals (Angwin and Larson 2016; Angwin et al. 2016), and (c) studies of facial recognition technologies that demonstrate decreasing rates of accuracy for female and dark-completed individuals (Buolamwini 2017; Buolamwini 2018).

5Rawls’ Theory of Justice is encoded into the central tool in CS-HU 130 because it (a) contains elements of each framework of ethics (i.e., virtue, common good, justice/fairness, rights, and utility), and (b) reflects an orientation to analytic philosophy is easily transposed into an engineering-oriented process. As such, it provides a wide platform and can be presented and used in a manner that fits into other engineering processes.
CS-HU 130 meets two days a week for five weeks. Each class period lasts 75 minutes. Each assignment begins with readings of relevant content prior to class. In the first class of the week, the instructor leads a discussion through which the case is analyzed. This analysis uses Rawls’ ‘original position’ (Rawls 1999) to identify intentional and unintentional wrongs suffered by victims in the case. This is done using ‘cognitive apprenticeship’ (Collins, Brown, & Newman 1988) through Socratic questioning, dynamic creation of lists and flowcharts of content from readings and student contributions.

Following this, students and instructor fulfill Rawls’ idea of shared rights and duties (1999) that address identified problems. This is done through creation of lists in response to each problem. The instructor curates these lists to ensure symmetrical relationships between rights and duties to fulfill the concerns of the ‘original position.’ During the second class of the week, students work in teams to complete an ‘elevator speech’ that describes how fulfillment of identified rights and duties can address identified problems. The goal in this part of the activity is to give students practice in producing brief, but data- and theory-oriented statements in support of valued moral and ethical position. The instructor moves from team to team to help student fashion these statements.

The final part of the assignment is the creation of similarly symmetrical lists of incentives and disincentives that could be imposed on each stakeholder to improve the chances that stakeholders will fulfill assigned rights and duties. As teams identify especially meaningful components of this elevator speech/memo and lists of incentives and disincentives, the instructor adds those to lists displayed on a chart projected from the teacher-station computer.

The process of cognitive scaffolding, including dynamic creation of process-documents, lists, flowcharts, etc., is rapidly taken up by students, as demonstrated in their independent progress. Products of student teams is understandably choppy, given the short period for action. However, through the term fall 2017 through fall 2018 median score on assignments is 17.9/20 with scores assigned against a focus on

An effort is made to inspect the case so that ‘wrongs’ suffered by multiple individuals through the case are identified in ways that inhibit claims of ‘reverse bias’ by individuals who have an orientation to such things.
content, appropriate use of keywords and flow through the four parts of the assignment.

Anecdotally, we can report that the energy of each class period is engaging for many students, and some remain after class to talk about nuances of the case and their own ideas. Perhaps more indicative is that, over the period from fall 2018-fall 2019, 388 students (319 male, 69 female) have responded from 90 percent to 100% in agreement with the following on culminating course evaluations.

- Are matters of professional morality and ethics relevant for computer scientists?
- Can professional morality and ethics contribute to becoming a better computer scientist?

From this we are optimistic that CS-HU 130 is influential in orienting students to issues of professional morality and ethics, and the course is successful in making content relevant and even perceivably necessary for incoming CS students. Given this, we think it not incautious to say we are starting off on a good stride toward meeting the second goal noted above.

However, we are aware of the isolated effects of instructional interventions and we designed an ongoing research project through which we would interview students each semester through the CS degree plan, with questions that focus on experiences as they especially relate to inclusion, diversity, and social justice. In the CSP-Hatchery project we will use these interviews in order to assess the impact of our attempts to affect the climate of BSU CS and conduct of students, and in turn to help us continually innovate in ways that improve our ability to so affect the climate and students. Here we report using data from these interviews and detailed accounts that make these important to our efforts and more broadly.

As of this writing, 46 students have been interviewed at least once, and 18 students interviewed two or more times. 33 interviewees are male, 13 are female. Zero are non-binary. We start with information about our students’ worlds, and how ‘the social’ is an important force from their pasts through their ongoing their day to day learning and conduct. We then describe how content introduced in CS-HU 130 fits (or does not fit) into their awareness of their everyday world as CS students.
Describing ‘The Way it Is’

All of our informants are representatives of individuals pursuing careers in STEM — Science, Technology, Engineering, and Maths. The popularization of STEM as a career field continues to grow at an astonishing rate. Five years ago, there were fewer than 150 BSU CS undergraduates and today there are over 800. This attraction to STEM disciplines has occurred across sex and other demographic categories, with women more prevalent in psychology, social sciences and biological sciences.\(^7\) There remains a disproportionate number of males throughout STEM and this is especially the case in CS.\(^7\)

According to the NSF, across STEM fields, CS has the lowest rate of participation by women, with 28\% for the year 2000 and 18.5\% in 2012.\(^7\) A similar trend occurs across ethnic and racial groups. According to DATA USA,\(^8\) the lack of parity in 2016 for CS education in the U.S. is as follows (Table 1).

<table>
<thead>
<tr>
<th></th>
<th>White</th>
<th>Asian</th>
<th>Hispanic</th>
<th>Pacific Islander</th>
<th>Black</th>
<th>Multi-Racial</th>
<th>Unreported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>7.3%</td>
<td>4.8%</td>
<td>1.6%</td>
<td>0.017%</td>
<td>1%</td>
<td>0.8%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Male</td>
<td>49.9%</td>
<td>15.5%</td>
<td>7.8%</td>
<td>0.2%</td>
<td>34%</td>
<td>3.3%</td>
<td>3.6%</td>
</tr>
</tbody>
</table>

The student population in BSU CS reflects disparities common with NSF and DATA USA statistics, with a greater proportion of white males and females than overall (Table 2).

<table>
<thead>
<tr>
<th></th>
<th>White</th>
<th>Asian</th>
<th>Hispanic</th>
<th>Pacific Islander</th>
<th>Black</th>
<th>Multi-Racial</th>
<th>Unreported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>10.1%</td>
<td>1.8%</td>
<td>2.2%</td>
<td>0%</td>
<td>0.02%</td>
<td>1.0%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Male</td>
<td>61.1%</td>
<td>5.0%</td>
<td>10.2%</td>
<td>0.1%</td>
<td>0.9%</td>
<td>4.1%</td>
<td>3.9%</td>
</tr>
</tbody>
</table>

Given the commonality of proportions reflected in U.S. and BSU CS, it is not uncommon to encounter the viewpoint that this ‘way it is’ is reflective of some deeper truths that are commonly communicated through a

\(^7\) https://www.nsf.gov/nsb/sei/edTool/data/college-14.html
\(^8\) https://datausa.io/profile/cip/110701/#/demographics
teleological, social Darwinist narrative that asserts that those who are not commonly represented in CS (or STEM more broadly) are somehow ‘less fit’ or otherwise ‘self select’ out of the field (for one recent and infamous case, see Damore 2017).

Systematic investigation of these notions has found them not to be the case: those not represented in STEM careers or in successively higher levels of STEM education are not ‘less fit’ and just as capable as types who are more prevalent (Ceci, Williams, & Barnett 2009). Ceci et al. (2009) do have something to say about the idea of ‘self selecting out’ of the field. They note that women who demonstrate high capacity and skill in maths and science also demonstrate higher capacity and skill in other academic areas.

From this they postulate that the rather rude notion of a ‘leaky pipeline’ of women out of STEM from K-12 through graduate school and professions is related to decisions to leave STEM not because of capability, but because social and cultural climate of STEM education and STEM professions is inhospitable, and their capacity and skills are more accepted in fields other than STEM. Tonso (2007) provides evidence of just this in STEM, and the same is reflected by others at many levels of STEM education, starting at the very beginning of computer science as a recognizable field of study (Ceyer et al. 1999; Fowler 2017; Hill, Corbett, & St. Rose 2010; Natanson 2017; MIT Computer Science Female Graduate Students and Research Staff 1983; Wolfers 2017; Wu 2017). While the disparity of participation in STEM may be an effect of many personal choices, the environments that make such choices necessary are not related to capacity and skill. Instead, they can be seen as the product of socialized discriminatory behavior in STEM (Ceci, Williams, & Barnett 2009; Seron, Silbey, Cech, & Rubineau 2016).

This sets the stage for the following analysis. We begin with data from our informants that helps us to understand parts of the social systems from which they come, and follow through with data that helps us to understand how what they are learning in college courses has limited purchase in the face of inertia from ‘the social’ that makes up their pasts, and the majority of their present lives.

PEER NETWORK FORMATION DEPENDENT UPON SOCIOCULTURAL BACKGROUNDS

Students form peer networks based on personal backgrounds and interests that arise from personal
histories. Their personal histories always occur within social systems that reinforce norms in their lives. This makes the argument that ‘the way it is’ is not just a fact that exists in the here and the now, but rather ‘the way it is’ arises from a set of norms that they have been subjected to accept.

It is unsurprising to say friendships rely in some way on shared experiences, interests and values. At the same time these alone are not enough for a durable relationship. Longer term relationships rely on recognition or development of new and emerging links and environmental opportunities to build into these things.

*High School into College*

It is often the case friendships are carried into college when high school friends attend the same college, or when high school activities are carried-on-with in college. We have found that computer gaming, and membership in the marching band are both activities through which individuals who are computer science majors also find likely ‘future friends’ and collaborators. For example, Ashton and Skimwax — both first-year CS students — described how high-school friends were a part of a college peer network. We pick up the conversation with Aston where he is describing a common class-companion and collaborator:

… Ashton: Yeah, it is a person that I do work a lot with. Umm, on my projects in [class name].
Interviewer: Is that somebody you knew before you got here?
Ashton: Yeah.
Interviewer: Did you plan to come to BSU together and work together, or did it kind of just worked out that way?
Ashton: Umm, a little bit of both. Because, I originally planned coming to BSU and he wanted.... There is actually two people that I work with a lot, and they both wanted to do computer science, but they both were… one was going to go to University of Idaho and the other one was going to go Utah State. And, I basically convinced them both about the CS program here and how many opportunities there are. And how, because I had come before and talked with the CS directors and stuff on how there is a lot of opportunities for internships after junior year and sophomore year. And so I told them that, and then it kind of turned into changing their minds and now they both really like it here, so they are both glad they came here. But, it kind of just turned into convincing them to come and since they are both doing the same major, it kind of just works that we have the same classes.”

Skimwax, described several ways his peer network from high school has carried into college:

Skimwax: [It’s more than just friends, because] with that individual we decided to take classes together.
Interviewer: And is that a computer science student too?
Skimwax: Um, she is a nursing major. Interviewer: Ah, okay. And how did you meet her?
Skimwax: Um, back in high school. We did [several classes] together.

And for another of Skimwax’s friends:

Skimwax: Social friends. And, I actually tried to take the English 102 class with him but he applied to it too late, so the class was full.
Interviewer: Oh. But you wanted to do that. You tried to extend that kind of a thing.
Skimwax: Um, for helping me? Hm. Not for help, but I just have a couple friends back from [name of high school] who actually came to Boise State.
Interviewer: And they’re just, they’re your social friends?
Skimwax: Having friends in classroom, I feel more, what should I say, backed up?
Interviewer: Okay, so if you have a question, you can ask that person?
Skimwax: Mhm.
Interviewer: And it just kind of makes you feel more comfortable because it is somebody you know in the room?
Skimwax: And somebody I can joke about, or chat.
Interviewer: Oh, so you would sit together in the classroom too, probably?
Skimwax: Mhmm.

Both Aston and Skimwax describe how peer networks have carried into their studies in college. For both, this includes individuals in CS courses, and in the case of Skimwax, a friend who is not a computer science major. For Ashton and Skimwax, their high school friends support not only curricular activities but add stability and emotional support. Later in this conversation Skimwax emphasized that he did not only receive support, but that he also sought to be “…a pretty good friend to others” also.

**Games as a Gateway**

Computer games, or ‘gaming’ as it is commonly known, is an activity popular with young adults independent of college major. For computer science students, some of the technologies at the center of modern multi-player online games play a supporting role in connecting people in unique ways.

A common example of this is the ‘Discord’ system. Discord is a networked software system through which dynamic voice and text interactions can be accomplished. Discord runs from servers hosted by gamers themselves. Setting up a Discord server is not difficult but requires technical knowledge and skill, and setting up a server puts one in a good position to control what one can do in a game and even beyond it. For example, Robbie says:
I have like a Discord server where me and my friends play video games, so I invited them to that, and then, uh, we started working on our assignments there, and now we all play games together. Things like that.

What has happened is that a common interest (gaming) has led Robbie to install a software system (Discord) that facilitates collaborative action in games, and that technology has in turn afforded connections with others sharing an interest in games. It also made it possible for Robbie and others to shift from gaming to college studies within the same context. That is, Discord allows games and computer science conversations to be part of the same activity. This both expands and reinforces peer relationships. It is now possible for members to do more than just participate in games, or school — Discord has a social cohesion-building function. Again, an example from Robbie:

When people were absent they'd send like a group [message] — cuz Discord was both voice and text. And it's on your phone so we have a big server with like 30 or so people on it. Where if someone wasn't in class, we have two channels, we have like School and Game. So there's a, it's like someone would go in the School subchannel and message and say hey I wasn't in class today, what did we cover? Something like that, was there anything important? If someone wasn't there. So Discord makes multifaceted interactions possible, and gives individuals ability to use Discord for multiple purposes (gaming, schoolwork) such that it actually reinforces the social network between members. New individuals can be added to the group. However, one has to know the channels are ‘there’ in order to join, so channels and related peer networks are semi-private, and use of those channels is very purposive to its members while at the same time flexible to their immediate needs and interests. The fact that CS students are gamers, and have developed the technical skill to install and run Discord servers makes this a sociocultural attribute shared by many of our informants.

*Boys in the Band*

We were surprised to learn about a connection that many computer science students have with the marching band. Schwinn — a first-year computer science student — emphasized that it is not so much the music as it is collaboration required to create the music and the marching formations expected in ‘band’.

Interviewer: Uh, [so] the social network you have with the band is a big deal. Do you have a similar social network with CS students? Schwinn: No [laughs] I don’t know very many computer science students, actually. I really like the teamwork that happens in band that it makes that hard work much easier and more fun.
His small network of CS majors changed rapidly around ‘band’. By the beginning of his third semester as a CS student, Schwinn had four housemates — two of them CS majors and two of them band members. One of the CS majors was a member of band in high school but had not continued with this in college.

We found that band and CS members seem also to plan their courses together. In several sections of CS-HU 130 ‘Foundational Values’ there were up to five members of band and they always sat in proximity of one another.

**The Society of Students and Faculty**

Along with the above, it is overwhelmingly apparent that one’s experiences in other courses and in direct or indirect contact with other individuals within or outside of CS are also strong influences on how one learns to be a CS student and aspiring professional.

While most faculty and students are patient and even nominally supportive of efforts to influence diversity, inclusion, and social justice in CS, some insist CS is an entirely technical and meritocratic discipline with no allowance for social factors (see Damore 2017; Oldenziel 2001), and even that discussion of social forces within CS is the problem (Damore 2017; Oldenziel, 2001). When social factors are part of the CS classroom, it can become a venue for power(ful) struggles over what constitutes diversity, inclusion, and social justice, and how one is allowed to engage those struggles in CS education.

**Peer Networks Built Around Shared Experiences Have the Effect of Stabilizing and Supporting Norms**

Peer networks, hobbies, and extracurricular activities are thus influential sociocultural factors through which individuals create, maintain, and grow collaborations. Those serve several functions for individuals — personal support systems, fluid avocational and study groups, and relationships that span personal, academic and even economic factors.

The inverse is also true. Some do not bring peer networks with them, and struggle to find them at college. For example, Joe is a member of an underrepresented group and describes not having advantages of
others who come from different schools with more resources, and the effects are not subtle.

Um, I would guess [pause] I guess it’s somewhat, for me, somewhat that sense of belongingness in the classes - because for me, I felt, um, when I started classes, I felt somewhat intimidated from other people because they have been to bigger schools and they had more opportunities, um, in learning CS while I came from a rural school where there really wasn’t much opportunities so I somewhat kinda doubted myself. I was like ‘should I be here?’ It’s a little harder for me to learn CS because there wasn’t really much in a rural school district back then. And well, um, but I feel like I do well here. It’s just for me, I just have to work harder because I have a different learning process.

Joe describes experiences that are associated with ‘imposter syndrome’ — he literally questions his place and belonging in CS and alludes to feeling he is an outsider. Joe also lives 30-minutes off-campus in a setting that is entirely separate from college and fellow students, facts that impose both geographic and intellectual distance from his principal activities at college. Unlike proximity to peers and fellow CS-majors and associated opportunities for avocation and study described by Robbie, Skimwax, and Schwinn, Joe suggests these gaps impose limits on him. This flow from socio-cultural resources is tantamount to the building of social potentials, and lack of those resources is an impediment to such building. Peer networks can surely sprout spontaneously, but existing socio-cultural networks contain a sort of inertia that members can use.

For Robbie, his Discord server provides a venue for him to reach out into his classroom and laboratory experiences and bring selected individuals into the technology network:

Interviewer: ...you arranged to [bring someone into your Discord chat system]?
Robbie: Yeah.
Interviewer: You did in class, you arranged to have this voice chat kind of a thing?
Robbie: It was, I have like a Discord server where me and my friends play video games, so I invited them to that, and then, uh, we started working on our assignments there, and now we all play games together. Things like that.
Interviewer: Okay, so you met them in the context of the class, but now they're also fellow gamers.
Robbie: Yes.
Interviewer: And it was all as a consequence of this Discord chat system. The server that you run.
Robbie: To do better on assignments, yeah.
Robbie: Cuz I mean, I have known friends in the class from before, who were doing better than me too. But I also had friends who were doing worse than me. And that's why like we, we had like a, I think at one point a Discord chat of like 6 or 7 people who were all in the class just working together. So it wasn't really a group project per say, but I mean we certainly help each other gain a better understanding of the material.

Biscuit is Schwinn’s fellow student and housemate. He was a member of band in high school but not in
college. He was a classmate of Schwinn’s in two courses during his second semester. At the time they met, neither knew of the other’s past or present participation in band, but when they met in classes their in-class and out-of-class interactions stabilized. They first began sitting together in open lab/study lab made available by the CS department, and eventually expanded this outside of study efforts. Biscuit became part of Schwinn’s network and they all became housemates — living and studying together.

In a way analogous to possibilities realized Robbie’s Discord server and cohort of gamers/CS students, band was a common thread that ended up being a sort of link for Biscuit, Schwinn and his friends from band. In both cases, these common threads of either gaming or band were part of the shared-but-initially-separate sociocultural history for these eventual friends, college students, and study partners.

Superficially different from the above, Books — a first year female computer science student — illustrates how hers and others’ status as female computer science students can be seen as a common factor in an emerging peer network.

Books lives on a dormitory floor designated for engineering and computer science students. The dormitory RA (resident assistant) is a faculty member in the College of Engineering, and there are regular planned activities built around students’ common academic pursuits. Books describes herself as shy, but her network in the dorm is ‘comfortably large’ and cohesive. It is also exclusively female. She says “there aren’t many of us” (i.e., female students in engineering and computer science) and a lot of female students in CS do not have the same personal history with CS, including all-night-long coding sessions, long-duration-gaming-sessions, and support from parents or other family members, and that this serves as a basis for their friendship and study partnerships.

When asked if it was the female-ness or different experiences in computer activities or the relative lack of family role models that motivated her she said, “...well, all of them. I mean, we’re all different from the stereotypical CS geek, and that difference makes us all the same — sort of.”

So we see how groups of friends, study partners, dorm suite-mates, even housemates, coalesce around some common socio-cultural resources, or, notably, the relative absence of some sort of unified
resource around the fact that they are studying computer science. What we see here is the fact that one is studying computer science and a member of a group of others with the same pursuit is not just built around the technical aspects of computer science.

INFLUENCE OF CS-HU 130 AND EXISTING AND GROWING PEER NETWORKS

We have provided evidence to indicate that many students in CS-HU 130 leave the class with demonstrated skills and expression of values supporting diversity, inclusion, and social justice in their lives as aspiring computer science professionals. These things are demonstrated in multiple ways through classroom assignments and in anonymous ‘course evaluation’ questions. We have also provided data from a series of interviews with students in which they describe their social connections and peer networks from the near past of high school, to the present as CS students at BSU. Many features of peer networks are associated with personal histories and to present activities as CS students. As such, their peer networks provide a continuous and even a pervasive influence on them as individuals.

A Sea Surrounding The Island

It is unsurprising to suggest that no matter what is transpires in a 5-week (or longer) course, experiences in other venues will be influential. For male students we have interviewed, among the most influential of their experiences is not having experiences that made lack of diversity, inclusion, and social justice observable. For those who have come to an awareness of experiences of others, being able to act based on this awareness is affected by willingness of others to assert their own positions.

For example, Robbie took CS-HU 130 during his first semester in BSU CS. In his first interview, he described how his parents and older sister have described their experiences observing and receiving subtle and overt injustice in technical professions and in STEM education. He told how his sister — as a graduate student in mathematics — described things Robbie recognized in reading assignments from Wu (2017) and Natanson (2017), including rules that prohibited female students from using the faculty lounge when male students had unproblematic access, and qualitatively sharpened criticism for female student in class and in research symposia that she classified as ‘macro-microaggressions’.
Robbie described himself as an ‘ally’ and how he would ‘...call out my friends…’ when they said or performed something he considered to be rude or sexist gesture. He admitted ‘...not everyone in my circle likes it, and I think some of have drifted away because of it… but those who are still my friends have either gotten used to it or agree with me.’

Following a second interview with Robbie, he described a confrontation in one of his courses when he tried to do something similar to that described above and was ‘...shut down’. The event occurred around a recent news story reporting how job advertisements for technical jobs were shown only to those who identified as ‘male’ in Facebook (Guynn 2018). Discussion of this occurred in one of his current CS courses. Some of his classmates had also completed CS-HU 130 and were discussing ‘...if this was really an issue of bias, or if it was just an accident…’

Robbie said it didn’t matter if it was intentional or accidental, and that either way it was still an instance of how Facebook’s advert placement algorithms treated people differently, based on a factor (male, female) that does not matter to a person’s capacity to do the job, and that this is an example of bias. The story described that women were effectively denied a chance to apply for jobs and, in turn, differential outcomes in eventual hiring decisions. The discussion turned to outcomes, rather than intentions, and how bias can be a product of processes designed without consideration of persistent social biases — a topic in CS-HU 130 (see also, Brayne 2017; Buolamwini 2017; Google 2017; Patel 2017).

Robbie said it seemed the discussion was turning to the idea that Facebook’s algorithms were in fact an instance of bias, when he added it was against the law to base hiring decisions on sex of applicants, thus Facebook’s case was also illegal. To this, another student, who had also completed CS-HU 130, replied ‘...just because something is in the law, doesn’t mean it’s the right thing to do…’

Robbie described how this one statement changed the discussion entirely, and other students in the course sided with this student’s comment. The oblique — if sometimes appropriate — comment questioning propriety of laws ended up changing the discussion to the point where differential outcomes in hiring arising from biased algorithms were discounted.
Robbie described how this led to him being labeled a ‘(social justice) warrior’, and others who were originally leaning to his interpretation then fell silent, leaving the conversation to those who wanted to impugn efforts to restore justice. Robbie described how he had become ‘persona non-grata’ in the class, and subject to microaggressions including dismissive comments, persistent interruptions, and even being ignored in whole-class discussions. Robbie ended by saying that he felt abandoned and isolated, and that he was — at least for the present — keeping quiet in class.

Robbie’s case describes a situation where others, even with similar classroom experience, find ways to deflect and dismiss what is apparently an instance of bias that arises directly out of computational processes (something directly in the purview of CS students and professionals) and turn it into a categorically-dismissive move against any appearance toward social justice.

When asked how this has played out in his Discord-connected cohort of gamers/CS students, he said “...we don’t bring it up. It’s not worth it right now. I’m not even sure I belong [in CS] anymore…” Robbie’s experience in class and follow-on settings has had a big impact on him. Conversant in terms like ‘microaggression’ and ‘stereotype threat,’ Robbie admits falling victim to the latter because of the former — he feels stereotyped as a ‘social justice warrior’ and reconsidering a career in which that is a liability!

*I Have a Friend in CS Who’s a Girl*

While overt efforts against bias occur in and outside class, there are also instances where individuals deflect personal responsibility in a way that can be interpreted as either claims that (a) ‘I’m not biased,’ or (b) it’s not happening here.

Thor is a 2nd-year CS student. As a white male, he says he fits in even though — as an individual who goes to the gym a lot — he sees himself as different from what he describes as ‘the usual 98-pound weakling CS-major’. He says since he lives off-campus he is not involved in many student activities and doesn’t have many friends in CS, and he is even self-conscious as an individual with big biceps and quads’ — making loose reference to being an outsider because of his body-image, and an allusion to the idea that while he fits ‘as a male’ he is still somehow prone to bias on account of his physique.
When asked about his experiences in classes and study activities he says that he has a regular set of study partners, both of whom he met in other CS and maths courses. “One of ‘em is a girl — she’s really small and, y’know, petite. She looks like the other girls in CS so she might even fit in better than me. We tease each other when one of us gets stuck on something that others have figured out, but it’s all in fun — I don’t think she gets (teased) more, and … I’ve never seen her get treated any differently.”

While we can’t contest Thor’s comment that his female study partner has been treated any differently, we can suggest that his characterization of himself as more of an outsider than she is curious. He acknowledges the ‘normality’ of males in CS, but seen himself (a) as more of an outsider, and (b) as nominally ‘not part of the problem’ perhaps because he has a female study partner in CS.

The Women Already Know

When interviewing women students, it was common to learn that they had already experienced situations that highlighted the lack of diversity, inclusion, and social justice in computer science. Books, a first year, female CS student, tells that she did not have the usual experiences with computers when she was growing up, and didn’t come to BSU CS with a cohort of friends from high school. Both of these allude to experiences stereotypically associated with boys she has met in the CS major. Her grades made her eligible for placement in the ‘Honors Dorm’ where high-achieving students meet and mingle with one another, and where they are provided with additional social, academic, and leadership experiences. Books says she could have chosen several different STEM disciplines for her major, but chose CS because in her last two years of high school had very good experiences in a class where the instructor “tried to keep everyone challenged, but having fun too.” It was the combination of intellectual challenge and fun that led her to choose CS, and she said she had an interest in designing and building games “…for everyone”.

When asked about this, Books said “…games out there seem to be designed for boys — they reward aggression and domination… not that some girls don’t like that too, but it’s just not for me.” Books highlights an effect of the ‘normality’ of males and stereotypical male orientations in computer science and in particular, computer games. She makes it apparent that she doesn’t want to replace such things, but to make
other things available to computer gamers, things that she sees as mostly missing.

When she arrived at BSU Books didn’t know anyone and without trying she said she made friends with “...a bunch of girls who like math and science and computer stuff; not all of us are CS but we all know we will use computers so we’re together helping each other a lot.”

The fact they are together and helping each other in their non-class time is part of what Books likes about her experience at BSU, and it is the class time and the few times she has gone to the CS tutor center that reinforce this for her. She describes the competition between “those other students,” even in the introductory courses, is unsettling for her. When asked what she meant by ‘those other students’ she exhaled loudly and looked around the room, eventually looking up and saying “it’s the guys. It’s like they don’t want to collaborate with me — with us — girls. When I ask a question they will just mumble and then turn away. I would rather collaborate with them, but it’s easier with the girls back in the dorm.”

Books wouldn’t say she experienced what she would call a microaggression, or bias because she is a female CS student, but suggests that her preference is for others who — at least — won’t just mumble and turn away, and who will actively collaborate. In this instance these are other female STEM students.

Another student with the pseudonym of ‘Five’ had a more overt experience with microaggression. While being interviewed, Five often discussed how other students and faculty in CS would avoid her questions or become nearly hostile. According to Five, this was a surprising experience, and in stark contrast to experiences in classes in other departments:

I thought it was going to be like some of my other classes where in math we sit at a table and we talk. “Oh, have you done number five yet?” “Oh yeah, totally. Let me walk you through. What don’t you understand?” Where in computer science, it seems very unfriendly to me, which I hate to say because I’m sure some of these people are really nice, but...

Five trails off, implying she has yet to meet these nice CS students. She states that she networks with students from another department, who welcome her despite being a different major. She goes on to say that she will either ask for homework assistance from these other students, or from the female learning assistant in her computer science class.
Five’s experience is that competition and not collaboration is favored in CS courses. One could say this reflects an implicit bias that reinforces certain ways of interacting and is activated in a way that punishes other ways of interacting. The culture in computer science has an effect on female students early on, and one can say that it makes a difference for Books, Five, and their fellow students, and that this has led to isolation and pulling back. Thor’s claims notwithstanding, a social environment that leads male and female students to work separately is not what would be considered an inclusive environment.

While Books was hesitant to report direct experiences of bias against her as a female student, Five describes an episode in which she came home frustrated from her day at school saying to her father, “Dad, I don’t know. I don’t know about this.” Without reference to any experiences ‘as a female student,’ her father said

‘Well, maybe don't twirl your hair. Don't put on this like ... Don't lose yourself, but also kind of strip away some of this really ditzy almost.’ Because sometimes I do that. When I think I'll tug on my hair or I'll do something, which makes me look apparently dumb. I don't know.

The comments from Five’s father are indications that he wants his daughter to not be perceived as ‘ditzy’ but the words are sharp! One can feel Five sensitive to potential stereotype threat from a source close to home. This reinforces what is reported in research and popular reports of gender-based bias.

*It’s Just a Thing to Study*

Skimwax is an easy-going student. His grades are good and he says he’s still positive about a career in CS. However, he says most of his friends are not CS-majors. Joe is the one exception, and Skimwax is quick to note that Joe is — like him — not a member of the majority of students in BSU CS (that is, not white males). Skimwax is also quick to note that most of the time he spends with his friends he is not thinking about CS. “And that's something I like about my friends — they're not so focused on one thing that we can actually relax and be friends.” When asked about *that focus* he sees in other CS students he describes how it always seems to be a contest to win.

In an interview, Joe says something similar. “I’m here to learn enough to get a job and move ahead in
life. I know that a career in CS is competitive, but I don’t want to do that now.” He refers to readings and a classroom discussion from CS-HU 130 in which research from Google shows that successful developers are good collaborators and not just good at technical skills (Dubey & Rozovsky 2016; Duhigg 2016). He says, “I know I can do that. [As was said in class] if Google wants that, then every company wants that. I think that’s more important.”

For Skimwax and Joe, as it is for Books, collaboration and friendship they have with others is an important personal, and apparently, professional, aspiration. Competition they see and get from others might not push them out of CS, but it pushes them out of the mainstream. While they might not feel isolated in closer-knit cohorts, they are separate from what they characterize as ‘normal’ in CS.

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**But Maybe It’s Because That’s What They Want To Do?**

From his appearance, Jim might conjure the stereotype of ‘just a nice, clean cut, kid’. Standing about six-feet tall, trim and athletic looking, wearing a shy smile and very soft-spoken, Jim sits for his interview with feet and knees together, and hands folded in his lap. In an interview shortly after he completed CS-HU 130, when asked about how the content of the class had influenced his thinking about CS, his eyes panned the ceiling. After a few seconds he said “...well, obviously you don’t want sexual discrimination and harassment and things like that. That’s just not how you’re supposed to behave.”

When asked about the obvious disparity of male and female students, and students of color, in BSU CS, Jim admits “my high school was almost entirely white, and there were the guys who went to shop class, and the guys who went out for sports and the guys who went to the computer lab, and the girls who went to do their things. It’s just the way it was.”

Asked about this gendering of ‘shop class’ and ‘sports’ and ‘computer lab’ Jim shrugged. “It’s just the way it is. I mean girls had sports, and some girls were in the computer lab and, y’know...” Having completed CS-HU 130 with a good grade, Jim should have been able to describe forces that ‘gender’ activities, vocations, and sports, but was unable to do so. After a few second of silence, Jim added, “maybe it’s because that’s what they want to do? I mean, people should decide for themselves, right?”
The next time Jim was interviewed, he seemed to have remembered that line of conversation. He said that he had gotten married over the summer and when he and his new wife drove back to town, they had a long conversation and he asked why she hadn’t decided to study science or technical things. In a meandering reply he said she talked about how she was influenced by (female) family members who did other things. He ended up glossing many of the stereotypically common gendered forces in a young boy’s or young girl’s life and seemed not to identify the subtle and very persistent pushes to play a particular gendered role. He knew, but he didn’t seem to know -- the way ‘it is’ was simply normal and unproblematic for him.

*Nothing Happening ‘Here’*

Nationwide data, including evidence from BSU, shows disparity in STEM and CS at BSU. The numbers show this is not a small disparity, but many interviewees suggest otherwise. Sam is a white male student. He says this about his experience so far,

The overall [BSU CS] culture, the very like hand outstretched, you know, we’re gonna try and help you accomplish this together and the support that I’ve received from the counseling side like with [the CS Advisor], um, it’s just been very supportive and a very positive environment.

Sarah is Asian, a female student, older than the usual CS undergrad, and has a family. She says,

Umm, the only thing that I’ve really noticed is that… and I’ve only taken 2 or 3 courses so far, so not a whole lot. I would definitely say there are fewer women in the classes, but I haven’t ever felt like anyone… but I haven’t ever seen anything bad come from that. Other than you know, the classes are just unbalanced. I’ve had all good experiences.

Sarah admits the disparity but deproblematizes it. Similarly, Thor told us

Um, it’s been pretty inclusive, I’d say. I mean, um, you don’t see- obviously you don’t see as many women in the CS department as you do men from at least my course catalogue and what I’ve been enrolled in. But I mean, um, I mean, one of my better friends here at the school here has been in 121- someone I started out with in [the introductory programming class] with, I mean, she’s been one that I study with and um, we share information about projects that we’re- that are assigned to us and we help each other and we kinda have a little clique, but she’s definitely like one out of the three or four girls that are in the program that I’ve seen kinda thing so.

Thor acknowledges the lack of women in CS, but takes it at face value. He is able to ignore any significant social issues surrounding the fact that there are limited women in the program because he has a successful
female peer. He’s not part of the problem because he has friend who is a woman. This resembles the racist trope “I’m not racist, I have a black friend”.

Jim acknowledges the disparity and knows from CS-HU 130 the types of things that can lead to low participation by women in CS, but it is still not familiar to him in a *personal way*:

I can't really think of certain instances I've seen it. Yeah, um. But it's like, it's something that I know occurs. Like we looked at all really big scale things, and these big companies that make these giant mistakes. And how they affect their company, and I obviously haven't seen any of that at Boise, but I, it's like, the simple fact of knowing that it can occur in these huge, large scale companies, shows that it can definitely occur in smaller scale, and like, my group projects, and any little business that I first work in.

The issue here, and with the responses above, is that systematic sexism present in CS culture is rarely visible. Jim thinks it unfathomable that “big scale things” could happen here. This demonstrates a disconnect from the undergrad CS program and “real world” CS. But it is not just male students who reflect this. Like male counterparts, female students can acknowledge the facts and the issues, but often appear to represent it as an abstraction that exists, but does not necessarily exist *here*, even when it does. This leaves us with the question, if our interviewees see it, and tell us about it, how is it that *it* is mostly rendered unproblematic?

How is it that when *it* is problematic that *it* is so quickly and (apparently) easily erased from acknowledgement?

Casual and everyday experiences flow from one’s personal past through the present. Experiences are always already influenced by values and norms in the social world, and these values and norms often reflect gender-based orientations to being and doing. The stereotypical intensity and focus and orientation to success in CS coming from being first, or fastest, fights against a value for collaboration. Casual and oblique references for or against universal truths, and use of such a thing to combat the already-impugned concept of social justice. All of these things help to shape an environment that is difficult to oppose.
CONCLUSION

Peer Networks Built Around Common Experiences Stabilize Other Things Too: The Durability of Hegemonic Bias in Undergraduate Computer Science Education

We see examples from our research that peer networks form and stabilize around factors that include shared personal experiences. Sometimes these networks operate as conduits or pockets of resistance and sometimes as means to realize a localized opportunity that facilitates success for an isolated group even if it nominally goes against goals of inclusiveness for the whole student body.

Because we live in a world where socialized norms typify personal and collective experience, we should expect that forces existing in the worlds from which peer networks arise will also be part of those social networks at college and in computer science — including forces that manifest in issues of bias, lack of inclusivity, and loss of social justice for members of underrepresented groups in computer science.

However, because these things may be part of what appears as unproblematically-normal for members of these groups, we should also expect that some members of these groups may not be (a) sensitive of them in their everyday lives, (b) able to identify what they signify, and (b) able to describe how such things are manifestations of particular hegemonic forces that themselves constitute a major part of ‘the way it is’. That is, where most people seem to casually dismiss anything ‘abnormal’ about their ‘normal world’ by lazily referencing “that’s just the way it is,” we want to make it very clear that ‘the way it is’ is more appropriately considered to be ‘the way we have allowed it to become’ through many mechanisms, including a pervasive uncritical acceptance of those things to which we are accustomed, even if we use that acceptance as a means to create subgroups that afford protection from those who might threaten success. Books’ girls-only group, and Robbie’s boys/gamers group that is patient to his aspirations to be a social-justice-warrior, are two such examples. In their isolation, Books and her peers have a haven free from whatever they see as counter to their preferred approaches to learning and success, and Robbie’s Discord gamer group affords protection from obtuse or pointed attacks against an inclination to social-justice in CS. Thor and his cohort that includes one female student provides him and perhaps others in the group with the ability to present
themselves as ‘not part of the problem’ even if it demonstrates just that. Skimwax and Joe and high school peers escape what they perceive to be an unhealthy concentration of competitiveness by being members with links outside of CS, and in so doing perhaps activate the spirit of inclusion and diversity at a scale that transcends the CS department alone. Schwinn, Biscuit and their cohort of CS and Band members may find the same. Forces common in ‘the social’ are unavoidable, but it appears that there are always ways to slip those forces, if only temporarily.

At the same time, even with the possibility of some form of escape, one may actually be playing into the normalizing and segregating aspects of those forces by acting intentionally to avoid them. Robbie admits to silencing himself and his aspirations to being a social-justice-warrior even while a member of his own Discord group. Books and her friends may be countable as members of the whole body of CS students, even while they isolate themselves to protect their preferences for learning together.

Curiously, separations and otherness persist even if individuals with diverse characteristics can be part of sub-groups within the groups. These appear not to be things that draw the attention of others, and by being present as members of underrepresented groups it is possible for many to see that there is nominal, demographic inclusiveness, that at the same time does not contest their socialized and stereotyped ideas of what ‘is normal’ in CS. For example, while Jim acknowledges that a problem associated with diversity, inclusion, and justice exists ‘out there,’ he simply doesn’t see it ‘in here.’
References


