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Reflective Statement

As I finally wrap up the biggest essay for this class yet, the main relevant thought on my mind is that I wish I picked a different issue. This comes after pondering my peers' essays which I reviewed, and discussing the class with my roommate who took the same class at some point. It was really this quote from him: "I have no idea why you're writing about that...like, it's important, right? But, for example, I wrote about particle accelerators". I usually don't regret anything though, and I find myself glad that I'm knowledgeable about the topic. As a white-passing male it's good to contemplate and understand what others go through, however, I feel like I've gotten a somewhat different experience from this class versus someone who wrote a proposal for solar panel technology, or about fine oil spills in the East Asian Sea. Basically my technical writing class proposal doesn't feel technical at all (and I understand that that is of my own doing).

Writing-process-wise, I am mostly surprised that I ended up with 9 sources, and find myself a lot better at researching than when I tried for Unit 1. This is somewhat obvious from the 9 sources versus my single source for that paper, but it's also that, if I had a question, I knew how to find a paper or article that either answered my question or discussed it at some level. I'm also glad I managed to stretch the Code.org article's usefulness over 3 Units. Everytime I read it, I figured out a new way to incorporate it into my writing.

My final comment is that my order for writing this was my weirdest but most effective yet. I started by outlining the background, then the proposal, then writing the non-intro-and-conclusion sections, then finally writing the intro and conclusion. It turns out that saving the most broad and sweeping paragraphs for last made a lot of sense, because usually that intro takes me at least an hour longer. So, without further adieu…

Context Note:

This is a proposal of different actions that can be taken to combat poor gender diversity in computer science. In particular, this proposal focuses on actionable measures to be taken at the educational level. The intended audience is educators and advisors who can modify classes and foster relationships with students, as well as legislators and legislation advocates who can push for computer science requirements in K-12 schools.

Section 1: Introduction

The demand for computer scientists in the workforce is increasing at a similarly breakneck rate as the complexity of today's computer science technology. However, women seem to be consistently left out of the rapidly advancing field. The percentage of female participation has been decreasing for the past two decades, even as companies begin to take note and claim to take action. The stigma surrounding computer science states that it is a subject for men, and erasing that assumption will require several changes to how computer science is approached at the educational level.

Section 2: Background

Women's role in the technology industry has always been relatively low, but over the past two decades it has been declining even further. In 2015, women earned only 18% of all computer science degrees. Women held 36% of computer science roles in 1991, and that percentage has since then sunk to 25% in 2015 (Ashcraft, C., McLain, B., & Eger, E). This is also reflected in positions of power; women only hold 11% of executive positions at Silicon Valley companies (Fenwick & West LLP). The stats continue on: as of 2016, the quitting rate for women in the tech industry was 41%, which was twice as high as the quitting rate for men (17%) (Ashcraft, C., McLain, B., & Eger, E), and women under 25 in tech companies earn, on average, 29% less than their male counterparts (Comparably). What these statistics obviously state is that there are not enough women enrolling in and staying in computer science programs through college, but they also paint an interesting picture of the treatment of women in the tech workforce.

The same stigma that causes women not to be interested in learning computer science in the first place is also present within many companies. It is easy to find documented cases of

unfair treatment in the industry. A well-known extreme example of this is Susan Fowler, an engineer at Uber who published a blog post in early 2017 detailing why she decided to leave the company months earlier. The ripple effect caused by her blog post eventually led to the resigning of Uber founder and CEO Travis Kalanick. The first event she outlined was an instance of sexual harassment by a manager who, when she reported him, was given the benefit of the doubt by HR. It turned out that several women had made the same complaint against him with similar results. The rest of Fowler's post details how her job was threatened by her complaints, and the refusal of Uber's upper-level management to listen to feedback from its female employees (Fowler, S. J.). The controversy surrounding the company's treatment of women is notable. While it could be argued that they are an outlier among similarly sized tech companies based on the types and amount of headlines Uber has generated over the past year, it is a clear example of what happens when the stigma surrounding women and computer science is scaled up to the level of mid-size and large tech companies: harassment and unfair treatment of female employees who worked just as hard as, if not harder than, their male counterparts.

Section 3: The Proposal

The subject of participation in the tech field by females is a significant and complex issue; its answer does not simply lie in one initiative. Rather, several different actions must be taken, and many multi-part plans must be successfully executed to change the attitudes that can cause the gender gap in the first place. In fact, a significant portion of the gender gap in tech industries can be traced back to females' attitudes towards tech at the educational level, as well as how those attitudes are being influenced by the current educational system. I am proposing two levels of solutions: one for teachers and advisors to implement directly into the

current system at their institutions,and one for higher up board members and officials to implement to change requirements of curricula.

The current educational systems tend to discourage females from enrolling and staying in computer science classes, albeit usually unintentionally. Teachers and advisors can reach out and build personal relationships with students that will allow them to keep in touch and encourage prospective and current female students. Also, introductory classes can be restructured to fit in with a new attitude that states computer science is not a male-exclusive field. For example, Moshe Y. Vardi of Rice University helped change their introductory computer science course from one, “about programming techniques to a course about computational thinking. The latter course is more popular with both male and female students, and also puts students...on a more level playing field” (Vardi, M. Y.). This will contribute to females staying in computer science courses instead of being potentially discouraged and pursuing other fields. Finally, creating groups specifically for female students in computer fields to gather and discuss can create the sense of, “camaraderie of an all-women computing group on campus” (Vardi, M. Y.), which allows for connection with other like-minded computer scientists.

At a higher level, computer science and other computing classes must be recognized as core components of modern day education. Currently, computer science courses are not required for graduation in the majority of middle and high schools. Up to a certain point, the gender-based stigma around computer science can be combated by simply requiring everyone to take introductory courses. If those courses are properly modeled to appeal to students of all genders, in the same manner that Rice University’s intro courses were remodeled, then female enrollment in computer-related majors would likely significantly increase.

Low gender diversity in the tech industry is commonly blamed on a lack of female applicants in “the pipeline”. Thus, there must be a way to increase the number in that pipeline,

by starting with education. If computer science becomes a core requirement in high school, middle school, or even all of K-12, and the classes are created or remodeled with all demographics in mind (including female students), then a far greater percentage of females with study computer science in college and go on to join the tech workforce.

Section 4: Incentives and Benefits of Change

The aspects of this proposal do not increase the percentage of women in computer science through direct measures such as simply accepting more women into programs or jobs. Instead, they are aimed at leveling the playing field through measures designed to encourage females and give them a better chance at prospering in the industry. First and foremost, and perhaps most obviously, this is about fairness. A young girl that might be interested in computer science should be able to find that out early on, and her education through college should only encourage her to continue in the discipline. In that same vein of fairness, there is a huge opportunity for women to make more money. Research from 2013 showed that, “40 percent of American women are the ones who pay the mortgage, who put the food on the table” (Chartier, J.). Those women could benefit from the higher-than-average computer science salary, as well as the large demand for jobs in the field.

This is also a matter of how today’s society will approach its problems. Computer science has yielded solutions to many modern issues, and holds the keys to many more. However, “Without a diverse group of developers tackling society’s problems, the industry’s field of vision is limited”(Chartier, J.). Solving any problem at any scale typically ends up requiring different perspectives, and the perspectives that can be brought by women to a male-dominated field are invaluable. This does not just concern fairness, it is about “enabling a large, key group of people to better participate in the problem-solving and societal improvement that technology brings” (Chartier, J.).

The correlation between diversity and a company's performance is not an entirely foreign concept. In 2015, McKinsey & Company's report *Diversity Matters* showed that, "Companies in the top quartile for gender diversity are 15 percent more likely to have financial returns above their respective national industry medians" (Hunt, V., Layton, D., & Prince, S.), while companies in the bottom quartile showed a similar, opposite effect. An updated 2018 report by McKinsey & Company on the same topic shows the same results, claiming, "While social justice is typically the initial impetus behind [diversity] efforts, companies have increasingly begun to regard inclusion and diversity as a source of competitive advantage, and specifically as a key enabler of growth" (Hunt, V., Yee, L., Prince, S., & Dixon-Fyle, S.).

Section 5: Examples of Other Initiatives

Moshe Y. Vardi, Editor in Chief of *Communications of the ACM*, took different actions to raise participation of women in Rice University's computer science program. In addition to modifying intro courses and creating a club for female computer scientists, Rice University had faculty members develop, "mentoring relationships with female students to motivate and encourage them, including offering opportunities from interaction beyond the classroom" (Vardi, M. Y.). This kind of interaction ensures female students are engaged in the major outside of their homework and provides valuable networking opportunities. In addition, sending Rice students to the Grace Hopper Conference allowed them to directly see other successful women in their field. Despite having no control over the admission pipeline, Vardi and his colleagues, "were able to raise the percentage of declared female majors from 14% in 2007 to 30% in 2014" (Vardi, M. Y.). The BRAID initiative implements similar measures in partner schools, with Harvey Mudd College seeing an increase in women majoring in computing from 12% in 2006 to 47.5% in 2016. Rice University and BRAID schools show that program modifications and

enhancements, accomplishable by teachers and other faculty, have a significant impact on women's involvement in computer science.

Hadi Partovi, CEO of non-profit company Code.org, wrote *A Comprehensive Effort to Expand Access and Diversity in Computer Science* in *ACM Inroads* to make the case for his organization and detail some major accomplishments. Code.org's major goals for the United States are, "computer science in every school and high participation across a diverse student body" (Partovi, H.). The pathway to these goals includes marketing computer science, assisting in development of teachers and curricula in schools, and advocating for change at the legislative level.

Code.org's Hour of Code is a one-hour introduction to computer science intended to increase participation in the field across all demographics. By working with educators worldwide, Partovi writes that, "with participation by tens of millions of girls and students of color, these educators have made a major dent in the stereotypes that surround our field" (Partovi, H.), and as a result of the intro, "2 million girls are learning introductory computer science on our platform, and that's growing by 4000 girls per day" (Partovi, H.). Partovi shows that getting girls started on computer science in a manner that reduces the mystery around it is enough to keep many of them interested. Code.org also created their own curriculum pathway, partnering with different companies to create courses for elementary school through high school. "Every month, 10,000 new teachers sign up, and each day over 10,000 students sign up" (Partovi, H.). Through these curricula, Code.org has a system in place that is easily implemented by teachers in their own classrooms.

Partovi is sure to emphasize that Code.org has a direct impact on involving students (especially female students) in computer science via the Hour of Code and their own curricula, as well as is advocating to change legislative policies. Most states do not include computer

science in their curriculum, but Code.org has worked with several organizations to change graduation requirements in sixteen states. Arkansas' governor Asa Hutchinson won his election, "on the platform of 'computer science in every school' using Code.org's advocacy materials" (Partovi, H.). Now, in Arkansas, every school is required to teach computer science, and Code.org is helping with the rollout. While not directly related, Partovi notes that Washington secured funding for a new computer science curriculum, while San Francisco will now require computer science for all students in all schools. Hopefully, legislators across the country will begin to take similar action, so that the standardizing of computer science in schools occurs nationwide.

Section 6: Conclusion

While the percentage of women holding computer science roles has been slowly but surely decreasing, the trend can be reversed by introducing females to the field early on and retaining them through college. Educators and advisors can implement a number of different plans in middle schools, high schools, and colleges while legislators and advocates can push for new policies requiring and funding computer science education in schools' curricula. There are already several examples of successful work towards this cause between Rice University and the BRAID schools, and Hadi Partovi's work with Code.org. The importance of this matter cannot be understated; women deserve an equal chance at joining and succeeding in computer science, and the field of computer science needs women in order for it to properly serve our society.

Bibliography

[1] Ashcraft, C., McLain, B., & Eger, E. (2016). Women In Tech: The Facts. Retrieved from https://www.ncwit.org/sites/default/files/resources/womenintech_facts_fullreport_05132016.pdf

[2] Fenwick & West LLP. (2014). Gender Diversity in Silicon Valley. Retrieved from https://www.fenwick.com/FenwickDocuments/Gender_Diversity_2014.pdf

[3] (Comparably) The Gender Pay Gap in Tech. (2016, June 13). Retrieved March 19, 2018, from https://www.comparably.com/blog/the-gender-pay-gap-in-tech/

[4] Fowler, S. J. (2017, February 19). Reflecting on one very, very strange year at Uber. Retrieved March 19, 2018, from https://www.susanjfowler.com/blog/2017/2/19/reflecting-on-one-very-strange-year-at-uber

[5] Vardi, M. Y. (2015, October 01). What Can Be Done About Gender Diversity in Computing?: A Lot! Retrieved March 19, 2018, from https://cacm.acm.org/magazines/2015/10/192372-what-can-be-done-about-gender-diversity-in-computing/fulltext

[6] Chartier, J. (2017). Driving Gender Diversity IN COMPUTER SCIENCE. Techniques, 92(7), 34.

[7] Hunt, V., Layton, D., & Prince, S. (2015, January). Why diversity matters. Retrieved March 19, 2018, from https://www.mckinsey.com/business-functions/organization/our-insights/why-diversity-matters

[8] Hunt, V., Yee, L., Prince, S., & Dixon-Fyle, S. (2018, January). Delivering through diversity. Retrieved March 19, 2018, from https://www.mckinsey.com/business-functions/organization/our-insights/delivering-through-diversity

[9] Partovi, H. (2015). A comprehensive effort to expand access and diversity in computer science. ACM Inroads, 6(3), 67-72.