Collaborative Research: CNS Core: Medium: How to Scale Up DNA Storage?
BPC Plan for David H.C. Du

Activity [1]: Recruiting and Retention of Under-Represented Minority and Female Students in Computer Science

1. Context

The University of Minnesota--Twin Cities is the state's public university and the only R1 institution in the state. Minnesota has a strong program of community colleges and K-12 school systems and ranks highly on many education and quality of life metrics in general; however, it also ranks as one of the worst states in terms of educational disparities and health disparities. The Twin Cities of Minneapolis and St. Paul are the population center for the state and home to diverse communities, including large Somali, Hmong, African American, and American Indian communities. Minnesota is home to 11 federally recognized tribal nations. The University itself resides on Dakota land ceded in the Treaties of 1837 and 1851, yet, American Indian and Alaskan Native students make up less than 1% of the UMN student population.

The Department of Computer Science and Engineering (CS&E) was founded in 1970 and is organized administratively within the College of Science and Engineering. CS&E offers multiple degree programs including a BS through the College of Science and Engineering, a BA through the College of Liberal Arts, and multiple interdisciplinary degrees in collaboration with other units. CS&E is the largest department in the College of Science and Engineering based on student enrollment data, with 59 faculty and 60 staff members serving more than 2,000 undergraduate students and more than 600 graduate students in its degree-granting programs in Spring 2020.

Demographic Data. By the numbers, CS&E's graduate and undergraduate programs both suffer from underrepresentation of BPC groups of interest. Women (regardless of race/ethnicity) make up ~19% of the undergraduate student body and ~32% of the graduate student body (including interdisciplinary programs in Cognitive Science, Computational Biology, Human Factors, Data Science, and Robotics). When examined by race/ethnicity, CS&E's domestic students from underrepresented groups make up only 6% of the undergraduate student population and just 5% of the graduate. The tables below aggregate all the degree granting programs affiliated with CS&E at the undergraduate and graduate levels and compare these to university- and college-level demographics.

Undergraduate Student Demographics (Spring 2020)

	Total	Women	Black or African American	Hispanic / Latinx	American Indians or Alaska Natives	Native Hawaiians & Pacific Islanders	Persons with Disabilities
University	35,165	53.6%	5.1%	4.4%	0.3%	0.1%	unknown
College	5,183	28.6%	1.6%	3.5%	0.1%	0.0%	unknown
CS&E	1,594	19.5%	2.9%	2.1%	0.8%	0.2%	unknown

Graduate and Professional Student Demographics (Spring 2020)

	Total	Women	Black or African American	Hispanic / Latinx	American Indians or Alaska Natives	Native Hawaiians & Pacific Islanders	Persons with Disabilities
University	15,392	55%	4%	3.7%	1.5%	0.2%	unknown

College	2,450	28.3%	1.5%	3.1%	0.1%	0.0%	unknown
CS&E	637	32.2%	1.1%	1.7%	1.6%	0.3%	unknown

Recruiting and Retention Data.
To focus effort where it is most impactful, it is important to understand how student progress through CS&E's programs (e.g., for undergraduates: applying, being admitted, matriculating, moving through intro courses, applying to the major, continuing to advanced courses, graduating). For example, CS&E faculty Gini and Watters discovered a high rate of non-passing grades within the introductory CSci-1133 course. Between Fall 2014 and Fall 2018, the "DFW rate" (Drop, Fail, or Withdraw) hovered around 30% (min 24%, high 40%). They developed a pilot intervention in Spring 2018, which reduced the rate to just over 9% and are now expanding the pilot with external support.

Dr. Du is currently supervising 8 Ph.D. students and one Post-Doc. Among them, two are female Ph.D. students and one female Post-Doc. He usually teaches networking courses (both undergraduate and graduate levels) and storage systems courses (graduate level). The female and under-represented minority students are around 10% in these classes.

2. Goals

The goals are:

1. Recruit and retain more female and under-represented minority students for both his research group as well as for the classes that he teaches.
2. Create an equitable and inclusive environment at all classes he teaches, as measured by bringing quantitative and qualitative experiences from members of underrepresented groups in line with the experiences of members of the majority.

The under-represented minority groups include:

- Women;
- People across the spectrums of gender and sexual identities and expressions, including lesbian, gay, bisexual, transgender, nonbinary, queer, intersex, asexual, genderfluid, gender-neutral, and gender nonconforming;
- African Americans;
- Hispanics;
- American Indians;
- Alaska Natives;
- Native Hawaiians;
- Native Pacific Islanders;
- Other Indigenous populations;
- Local and recent immigrant populations;
- People with both apparent and non-apparent disabilities;
- First-generation students;
- Students from economically disadvantaged backgrounds;
- Students who are parents;
- Others who might encounter barriers in our discipline based on their religious expression, age, marital status, origin (national or rural/urban), ethnicity, or veteran status.

3. Activities

Dr. Du plans to carry out the following activities to achieve the proposed goals:

a. He will participate the departmental student recruiting effort by visiting local colleges and universities with special attention to recruit American Indians from local tribes.
b. He will advertise his courses to female student groups to attract more female students.

c. For all his classes, he will form a mentoring group especially for the under-represented minority students to make sure that they will have a smooth learning process.
d. For the proposed project, there is a great possibility of attracting more female students from bio-tech side. He plans to put in a special effort to work with them to ensure their success of completing the proposed project.
e. He will participate in Summer NSF REU Site programs and host some students from these programs in his research group.
f. He will support and encourage his female students to participate annual MinneWIC and Grace Hopper activities.
g. He will recruit more under-graduate under-represented minority students to work in his research group.
h. He will assist his research collaborative companies including HPE, Seagate, Intel, IBM, etc. to recruit more female and under-represented minority students for summer internship.

4. Evaluation

The progress of these BPC activities will be evaluated annually to identify the activities that need to be further strengthened. The progress can be measured in the following ways:

a. Measure overall satisfaction with the activities, feelings of belonging, and similar metrics of climate and student experience using survey instrument; increase participation in surveys to make these measures more accurate.
b. Collect the outcomes of these activities by measuring the number of female and under-represented minority students increased in each type of activities.