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## CONTEXT

The University of Notre Dame is a private Catholic university located in Northern Indiana and situated within a racially/socioeconomically diverse region of the state. Notre Dame is partially surrounded by South Bend, IN, a post-industrial mid-western city where the high schools are made up of about 37% African American, 23% Hispanic, 28% White, 10% Multiracial, 1% Asian and 1% Native American and Pacific Islander students. Nearby Elkhart county is equally diverse including 42.1% White, 15.6% African American, 7.9% Multiracial, 1.1% Asian, and a large Hispanic community (33.2%). As the local community and University are interdependent, Notre Dame seeks to be deeply engaged with the local community in which it resides and to significantly increase the diversity of its student population.

With 30% female undergraduates, the Computer Science and Engineering (CSE) department has made excellent strides toward the University makeup of 46% females. The minority undergraduate makeup in CSE (3.8% African American and 9.8% Hispanic) is similar to that of the University (4% African American and 11% Hispanic), however, the CSE department has identified a unique challenge -- while the CSE department has an excellent graduation rate for students from underrepresented groups (UGs), the Hispanic and African American students are not thriving and are often graduating with GPAs significantly lower than the rest of the CSE student population. This is not acceptable.

Finally, while the CSE department has excellent students with an average entering SAT score of 1475, and an excellent graduation rate, a very small percentage (5% over the last 5 years) of our undergraduates, especially those from underrepresented groups, pursue graduate studies

## GOALS

Our three primary goals are to (G1) have a presence in the SBCSC every semester within the next four years with at least one program or event each semester to build computational agency and encourage UGs to pursue computer science, (G2) to raise the graduating GPA of students from underrepresented groups (particularly African Americans and Hispanics) within four years, and (G3), to increase the number of students from these groups engaged in a significant research experience. We view these goals as broadening participation at multiple levels. G1 focuses on encouraging students from underrepresented groups (which make up a high percentage of SBCSC students) to pursue computing degrees at ND or at any university. G2 is aimed squarely at helping these students not just succeed, but thrive at Notre Dame. Finally, G3 aims to encourage these students to pursue graduate degrees.

## ACTIVITIES AND EVALUATION

The CSE department already has a number of BPC efforts underway that contribute toward our goals. Here we briefly describe those activities in more detail and then present new activities for G1-G3.

**Student and Faculty Retention [Contact: Prof. Metoyer]:** *Grace Hopper and Tapia Conference Participation:* The department sponsors annual trips for undergraduate students each year to both the Grace Hopper Conference (~25 students) and Richard Tapia Celebration of Diversity in Computing Conference (~10 students). Broad faculty participation is encouraged. *Undergraduate Research:* Faculty provide research opportunities for underrepresented undergraduate students during the academic year and summer<sup>1</sup>. *Databuddies:* We participate yearly in the Databuddies project with CRA and utilize this data for end of the year adjustments.

<sup>1</sup> This data is currently not tracked, but will be for the 2020-21 academic year forward.

**Outreach and Recruitment [Contact: Prof. Niemeier]:** *Research Experience for Teachers:* Faculty provide an opportunity for a K-12 teacher from the South Bend or Elkhart school district to participate in an immersive research experience during the Summer (17 teachers participated in 2019). *Code School:* Faculty and students engage with local high school students through the South Bend Code School after-school program.

**G1 Activities [Contact: Prof. Niemier]:** The first goal will be achieved through activities that engage teachers, counselors, and students from underrepresented groups in the local school system. In particular, faculty will engage through Research Experiences for Teachers (RET) efforts, K-12 computational thinking and programming programs, and programs that engage high school counselors. **Metrics:** Success will be determined through measurement of the number of K-12 schools in which the CSE department establishes a regular presence (Instrument: internal tracking), the number of teachers and counselors from local schools participating in training efforts (Instrument: Faculty reporting), through the number of local high school students interested in studying computer science in college (Instrument: Survey), and by the satisfaction and self-efficacy of students participating in the programs (Instrument: Survey).

**G2 Activities [Contact: Prof. Bui]:** Our second goal is to not just retain and graduate our students from underrepresented groups, but to enable them to thrive within our CSE program. We believe that these students do not necessarily thrive in our program because 1) while meeting the University admissions requirements, they typically arrive with less computing experience and generally lower levels of STEM preparedness than other students due to a lack of access, and 2) our curriculum currently requires that student cohorts progress in lock-step, therefore placing highly prepared students in the same classes with those who are under-prepared or even properly-prepared. In addition, our university is predominantly white, and students from underrepresented groups often struggle to engage in study groups and cohort activities. We intend to address these issues by 1) creating flexibility through differentiated pathways within the curriculum and within single courses, and 2) directly supporting cohort building through departmental participation in the Grace Hopper Conference and the Richard Tapia Conference. **Metrics:** Success will be measured by tracking GPAs of students from underrepresented groups (Instrument: academic records), the number of these students getting internship offers (Instrument: Survey), the percentage of best practices in use in core classes (Instrument: NCWIT Checklist), the number of faculty trained in inclusive practices (Instrument: Survey) and by overall satisfaction of students (Instrument: Databuddies Survey).

**G3 Activities [Contact: Prof. Thain]:** Is it well known that undergraduate research opportunities help retain students as well as encourage them to pursue graduate education. Our third goal requires a more concerted effort to place students from underrepresented groups into research opportunities and to recruit students from these groups from other schools into our undergraduate research positions all with the aim of improving our pipeline to graduate school and academia. We will 1) match students from underrepresented groups with research opportunities at ND and elsewhere, and 2) recruit students from underrepresented groups to CSE summer research opportunities from other schools. **Metrics:** Success will be determined by the number of our students from these groups placed in REU positions each year (Instrument: student surveys, Databuddies), and 2) the number of students from these groups attending or with an intent to attend graduate school (Instrument: Exit Survey & follow-up tracking).

**G1, G2, and G3 Activity [Contact: Prof. Cleland-Huang]:** Finally, all of our goals will benefit from training graduate students to understand best practices in Broadening Participation. Thus, we will include graduate students in the organization of BPC activities and mentoring of students. **Metrics:** Success will be determined by the number of our graduate students who have (1) engaged in one or more seminars each year and (2) (co-)supervised an underrepresented research student.