

Connecting with Computing: Exploring Black/African-American Women's People-Centered Interests in Computing Sciences

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Abstract—Promoting inclusivity and increasing the representation of women in the field of Computer Science (CS) has been an ongoing initiative. When it comes to Black/African-American (AA) women, their underrepresentation in CS is even more disproportionate. CS is a field that is ever-evolving, but its ability to be perceived as a field that is inclusive-to-all has been a continuing challenge. One notable reason is that CS comes off as a field that lacks altruism by nature. For instance, literature shows that women tend to gravitate away from CS for fields that align more with their interests for helping others. However, CS in nature can create spaces that provide platforms for women, especially women of color, to express their personal interests.

This article addresses such potential in CS by discussing a two-year study that was conducted on 51 Black/African-American female students who were enrolled in an introductory and intermediate CS course at a historically black university in the mid-Atlantic United States. In these respective courses, the assigned final project allowed students to choose their own original projects while showcasing their learned computational knowledge and developed programming competencies. The objective of this study was to observe the types of project topics that these 51 women, in particular, chose for their assigned final projects in these respective courses. The results revealed that 92% of the topics chosen tended to be ones that were altruistic in nature. Likewise, this study reflects potential support for the ability of CS to exhibit inclusive spaces for such interests.

Keywords—Black/AA women, altruism, CS spaces

I. INTRODUCTION & RELEVANT LITERATURE

Increasing diversity and inclusivity within the field of Computer Science (CS) has been a longstanding issue—especially broadening participation for women. Within higher education, women have been underrepresented amongst CS majors for some time [4]. Also, research suggests biases against women within the labor market [3, 6]. Despite the need for more women in CS, literature indicates that there are critical gender differences related to STEM interests that must also be acknowledged—specifically *the general preference among women for occupations that center around working with people versus things* [5]. While research discusses the interests of women in general and how they inform STEM-related decisions, studies concerning Black/African American (AA) women's STEM interests are scant. Furthermore, there is a need to explore the interests of these women in CS given their underrepresentation even relative to women from other racial/ethnic groups [7]. Moreover, scholarship notes that

collegiate Black/AA women in computing sciences report feelings of cultural isolation and subordination [2]. Given the specific barriers of Black/AA women in CS, and literature which suggests a general preference amongst women for professions that emphasize working with people, this study explores how such an orientation may manifest amongst Black/AA undergraduate women within undergraduate CS coursework.

A. Motivating Research Questions

The following research questions are examined: 1) To what extent do Black women exhibit a people-centered interest within their undergrad CS coursework? 2) Is such an interest higher for Black/AA women vs Black/AA men? 3) In what ways does such an interest manifest amongst Black/AA women?

II. RESEARCH DESIGN

A. Target Courses

This study was conducted as a pilot study over a two-year semester span from Spring 2017 to Spring 2019 using data from a CS2 programming course and an advanced programming course at a historically black university in the mid-Atlantic region of the United States. The CS2 course exposes students to introductory-level programming in Python while the advanced programming course exposes students to intermediate-level programming in C++. Each course contains a final project that examines the students' ability to self-identify a computational problem that is original in nature, identify and apply the appropriate data structures and coding paradigms to solve it, and confidently defend the data structures and coding paradigms chosen to build their solution. During the latter semesters, students conducted their final projects in groups in an effort to develop group-based learning experiences and skills.

B. Procedure

Document analysis [1] was conducted using data from the two CS courses. These particular courses were selected for this study because: 1) *they are taught by the same instructor* and 2) *a final project is consistently a requirement for course completion*. Document analysis of the final project topics was used to generate themes that represent the nature of the students' expressed topic of interest. These interests were then

categorized on the basis of people-centered vs non-people-centered foci. Eighty-one projects were evaluated: 45 projects were done by male students (control group), while 36 projects were linked to the observed women students (experimental group).

III. DATA ANALYSIS & FINDINGS

A. Demographics

This sample included 51 females and 53 males enrolled in the indicated CS courses. Ninety-one percent of the male students were Black/AA, 4% were Asian, 4% were Hispanic/Latino, and 2% were Arabian. No non-Black female students were enrolled in the courses. The sample included students ranging from freshmen to seniors. Ninety-three percent of these students were CS majors.

B. Centralized Themes

Figure 1 provides a dual bar chart reflecting the trending topics from all 81 projects, which are separated by the control and experiment groups, respectively. Based on analysis of the final projects, the following themes emerged regarding the students' final project topical areas: *Education*, *Entertainment*, *Financial*, *Food*, *Health*, *Sports*, *Travel*, and *Other*. For the experimental group, projects related to *Education* and *Health* were most prevalent, followed by projects related to finances. For the control group, projects most often fell into the *Other* category followed by the *Financial* theme. Amongst the experimental group, there were also 7 projects that exhibited multi-theme characteristics (these scenarios were not the case for the control group). These 7 projects were classified as: *Education/Financial*, *Education/Health*, *Financial/Health*, or *Financial/Travel*, respectively.

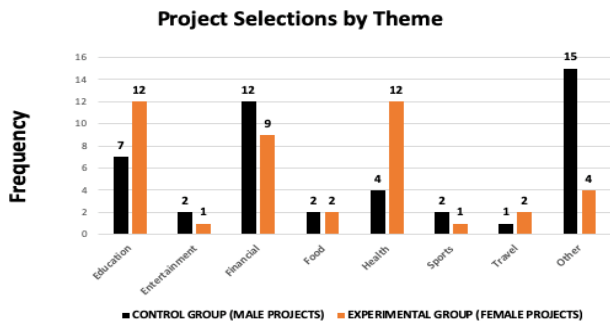


Fig. 1. Centralized Project Themes and their frequencies of occurrence.

C. Projects: People-Centered vs. Non-People-Centered

Another aspect of this analysis was to determine gender differences regarding people-oriented vs non-people-oriented topical areas. Amongst the control group, 51% of the projects emphasized working with people in some capacity. Subjects regarding *Financial* and *Education* exhibited the highest trends for this group (as noted in Figure 2). Amongst the experimental group, 92% of the projects were people-oriented in nature. Subjects regarding *Health*, *Education*, and *Financial* exhibited the three highest trends for this group. When observing the projects categorized as *Other* for both groups, it

was found that only 20% of these projects amongst the control group were people-centered, while 100% of these projects amongst the experimental group were people-centered.

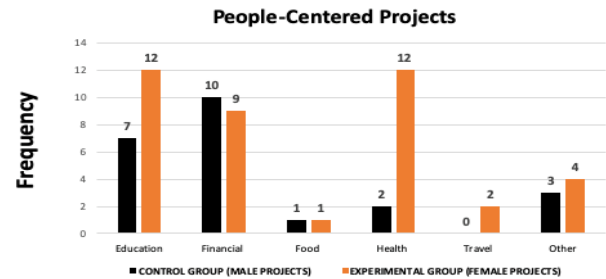


Fig. 2. Projects that were found to be People-Centered (both groups).

IV. DISCUSSION & CONCLUSION

Guided by existing literature regarding interest differences by gender and implications for STEM [5], this study explored the particular interests of Black/AA women in CS. Such a focus is important given the low representation in CS, and the need to better understand their interest to broaden their participation in CS fields. The Black/AA women in this study exhibited people-centered interests within their undergraduate CS coursework at higher rates than their male counterparts. They connected these interests employing their computational competencies to address real-world issues in areas that emphasize working with people. The ability to make these connections was fostered by a final project that allowed students to choose a project topic related to their interests and employ appropriate CS computational skills to develop a solution to address that topic. From a pedagogical and inclusivity standpoint, this study suggests that decisions employed when designing student assignments may help to create an inclusive classroom that allows students to explore their interests in authentic ways. Such an approach may also be a fruitful way for women to explore the ways in which CS can be understood as a field with applications that focuses on working with people and helping others.

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