



# Effects of Community Cultural Wealth on Black and Hispanic Women's Persistence in P-20 Computing Education

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Lillianna Franco Carrera, PhD is the Postdoctoral Scholar at Texas State University in the Department of Organization, Workforce, and Leadership Studies. She received her doctorate in higher education at Loyola University Chicago. At Loyola University Chicago, Lillianna served as a teaching assistant in the higher education program and as a graduate research assistant where she contributed to research regarding academic research collaboration and employment stratification in STEM labor. Her research primarily focuses on first-generation Latinx college and career choice experiences, the personal and purposeful development of young adults through the college choice process and college experience, high school counselor and other support services/programs for underserved populations, academic success of racially marginalized populations in college, experiential learning practices, and student affairs professionals' experiences. Lillianna is passionate about improving the diversity and inclusivity of students in underrepresented careers and colleges. Lillianna also has over 12 years of professional experience as a student affairs professional in areas such as enrollment, admissions, advising and student success.

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*Abstract*— Building upon previous National Science Foundation (NSF)-funded research, and research related to STEM persistence and counter-life herstories, this study is part of a larger, longitudinal, mixed-methods sequential, explanatory, NSF CAREER project that examines the influence of community cultural wealth (CCW) on the persistence of Black and Hispanic females in computing majors as they matriculate from middle school into high school, into undergraduate education and into graduate school or the computing workforce. In this preliminary study, Dr. Shetay Ashford-Hanserd, CAREER Principal Investigator (PI) is accompanied by Postdoctoral Scholar, Dr. Lillianna Carrera, to illuminate Black and Hispanic women's educational trajectories and lived experiences that have influenced their persistence in undergraduate computing education at a Hispanic Serving Institution in Texas. Data collection instruments include the reliable ACCEYSS STEM+C majors survey instrument and counter-life herstories interview protocol. To provide an anti-deficit understanding of how Black and Hispanic women access their strengths to survive and resist forms of oppression, the CCW model is utilized as a theoretical framework. The CAREER PI modified the CCW model to include spiritual capital because it serves as a critical source of fortitude and resilience in the Black and Hispanic communities. Research findings will highlight how CCW influences Black and Hispanic women's persistence in computing education in response to our collective need to better support this population in their attainment and representation in STEM+C disciplines.

*Keywords*— *community cultural wealth, Hispanic-serving institution, persistence in STEM+C, undergraduate computing majors, underrepresented minority students (key words)*

## Introduction

In the United States (U.S.), women represent 49% of the overall population (ages 18-24), 50% of the STEM workforce, but only 15% of the computing (i.e., computer and information sciences) workforce [1], [2]. Historically underrepresented minority (HURM) women, particularly Black and Hispanic women, represent 16% of the overall U.S. population, yet HURMs in general represent 16.73% of the STEM workforce and approximately 23% of the computing workforce [2]. While the percentages of Black and Hispanic women in the STEM and computing (STEM+C) workforces are unknown, their underrepresentation in these workforces is apparent. Furthermore, Black and Hispanic women, and other HURMs, are underrepresented in U.S. computing education at every postsecondary computing degree level, particularly at the graduate level [3]. Since Black and Hispanic women's underrepresentation in U.S. STEM+C education is largely due to barriers related to hegemonic structures, implicit biases, and internal racism associated with deficit mindsets (e.g., imposter syndrome, implicit biases), this study utilizes the Community Cultural Wealth (CCW) model as an anti-deficit lens to illuminate how HURMs access their strengths to survive and resist forms of oppression [4]. As part of a larger five-year, longitudinal, mixed-methods investigation examining the effects of CCW on the persistence of Black and Hispanic women in the computing workforce pipeline (grades 8-17) as they matriculate from middle school into high school, into a bachelor's degree program, and into graduate school (i.e., master's or Ph.D. degree) or the Computing workforce, the aim of this qualitative study is to illuminate the educational trajectories and lived experiences of Black and Hispanic women that have influenced their persistence in undergraduate computing education.

## Project Description

The overarching research question guiding this study is “What are the counter-life-herstories (lived experiences) that influenced the persistence of Black and Hispanic female computing majors in grades 8-17 at a Hispanic Serving Institution in Texas?” The Community Cultural Wealth (CCW) framework, which is undergirded by critical race feminism, depicts a more anti-deficit approach to understanding the cultural capital of HURM populations and hence is applied in this study [4]. The CCW framework acknowledges how communities of color resist forms of oppression by utilizing the six forms of capital that are highlighted as: aspirational, linguistic, familial, social, navigational, and resistant [4]. Additional to these forms of capital, spiritual capital is another source that can exist within these other forms of capital or independently to provide individuals with strength and resilience [4]–[6]. Aspirational capital values the resiliency of HURMs as they encounter institutional or systemic barriers typically found in educational settings. Linguistic capital is defined as the skills attained to communicate in more than one language or style. Familial capital depicts the benefits of supportive family and extended community members. Social Capital represents the social networks that HURMs engage with. Navigational capital is the form in which HURMs “maneuver through social institutions” in particular when they are racially hostile environments [4], [p. 80]. Resistant capital is utilized by HURMs to challenge inequities through actions. Finally, spiritual capital is recognized as the sixth form of capital as historically Black and Hispanic communities often use spirituality and religion as a source of strength [5], [6]. Hence, the above forms of capital were used to develop the methods and analysis of this research project.

In this preliminary mixed-method study, the research team identified a convenience sample of 20 Black and Hispanic women who identified themselves as computer science majors at an HSI in Texas. We emailed all undergraduate computer science majors a link to the survey and invited Black and Hispanic students to participate. The survey included a Likert-scale question with 23 factors that influenced their persistence in the computer science major. These factors were developed with the CCW model in mind. The Likert-scale question ranged from 1, strongly disagree (made me want to change major/program) to 5, strongly agree (strongly made me want to stay enrolled). At the end of the survey, students who identified themselves as Black and Hispanic females were asked if they would like to participate in an interview, which is the second data collection instrument. Those who agreed were contacted and invited to participate in one-on-one interviews, via zoom, using counter-life herstories or a method for sharing a retrospective account of their life experiences. Data elements that were collected included: timeline interviews (i.e., audio files, handwritten or Microsoft PowerPoint documents), semi-structured counter-life story interviews (i.e., audio files), and digital participant reflective journals writings (i.e., Google Docs documents). Both the survey and interview data collected were individually analyzed and then, merged to explore how CCW influenced the persistence of Black and Hispanic women in their computing education.

We will analyze the survey data utilizing descriptive statistics and *t*-test analysis, and we will analyze the qualitative data using an inductive thematic analysis approach [29] to identify emergent themes based on the codebook of CCW components. Before conducting data analysis, the graduate research assistant transcribed the interview audio file verbatim. To identify, analyze, and summarize the emergent themes, the researchers will follow a six-step thematic analysis process [29]. First, the interview scripts will be read for familiarity. Second, a list of codes derived from the interview protocol and research questions will be manually entered into a Microsoft Excel document. Third, an inductive process will be employed to code interviews by manually organizing participants' quotes under each associated code in the MS Excel document and then by performing open coding by adding new codes as needed while reading the interview transcripts [30]. Fourth, the list of codes will be reviewed and refined. Fifth, high-level themes will be identified, and the codes and the associated quotes will be manually regrouped under these themes. Finally, the final report of emergent themes with the associated participants' quotes will be produced. The coding results will be verified by another researcher who

will review the emergent themes and related quotes. The second iteration of coding will be conducted to identify sub-themes. Finally, the interview transcripts will be loaded into the NVivo qualitative data analysis software to ease accessibility for comparison with future studies. We will employ data triangulation methods [31] and member-checking [32] by emailing participants a copy of the transcripts to obtain their feedback. We are committed to exclude any language that the participants deem necessary.

## Results

Based on the outcomes of our data analyses, the findings are forthcoming. Our findings will highlight the ways in which CCW influences Black and Hispanic women's persistence in computing education in response to our collective need to better support this population in their attainment and representation in STEM+C disciplines.

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