BOARD # 312: (NSF ITEST) The Alabama LEGACY Project: A Peer-learning Community Model to Provide AP CS Preparation and Career Awareness for Black Young Women

Dr. Mohammed A. Qazi, Tuskegee University

Mohammed Qazi obtained his PhD in 1997 from the Ecole Polytechnique de Montreal (Universite de Montreal), Montreal, Canada. Subsequently, he was awarded a Postdoctoral Fellowship of the Natural Sciences and Engineering Research Council of Canada (NSERC) to further develop his scientific research. Currently, Dr. Qazi is a Professor of Mathematics at Tuskegee University and serves as an Associate Dean for Research and Outreach in its College of Arts & Sciences.

In his scientific research, Dr. Qazi works on problems in the field of Theory of Approximation. He also assumes leadership roles on multi-institution partnerships funded by the National Science Foundation, the US Department of Education and Alabama State Dept of Education to broaden participation of individuals from communities traditionally under-represented in STEM at all levels. At the core of these programs is the implementation of research-based mentoring models designed to promote student success in STEM and their preparation for the STEM workforce. He is also engaged in implementing Professional Development opportunities for K-12 teachers from under-served areas in Alabama (State-wide) so they have the curricular resources to provide all students with College preparatory experiences in STEM.

Dr. Qazi's mentoring efforts were recognized by the White House as a recipient of the 2021 Presidential Award for Excellence in Science, Mathematics and Engineering and Mentoring (PAESMEM).

Dr. Jeff Gray, The University of Alabama

Dr. Jeff Gray is a University Distinguished Professor in the Department of Computer Science (College of Engineering) at the University of Alabama. He serves as the Director of the Randall Research Scholars Program (Honors College), the oldest interdisciplinary research-based Honors program in the United States. As a first-generation college graduate, he received a Ph.D. in Computer Science from Vanderbilt University and also a BS/MS from West Virginia University, where he was a member of the Honors program and graduated summa cum laude in three years. His research interests are in the areas of software engineering, computer science education, programming languages, and human-computer interaction – with a specific interest in opportunities to support interdisciplinary research. Over the past two decades, he has mentored students at the high school (35 projects, with 11 International Science Fair finalists), undergraduate (over 160 student projects with multiple publications and awards), and doctoral (chair of 17 completed Ph.D. dissertations) levels. With his students and other colleagues (331 different co-authors), his research publication activities include over 100 journal articles and editorials, 18 book chapters, 189 refereed conference and workshop papers, over 130 posters (the majority as undergraduate and high school projects), 10 demonstrations, 21 tutorials, and over 25 panels. His Google Scholar h-index is 45 with over 7,900 citations (20 papers with > 100 citations). Funding to support his research has been granted by the National Science Foundation (multiple awards), DARPA – Defense Advanced Projects Agency (multiple awards), Google (multiple awards), IBM, Air Force, Boeing, College Board (multiple awards), and the Department of Education (multiple awards). There have been 44 funded awards for his research (as PI or co-PI), with a total combined dollar value of over $23M.

Dr. Gray is a National Science Foundation CAREER award recipient and was named the Professor of the Year (Alabama, 2008) by the Carnegie Foundation for the Advancement of Teaching. Jeff is a Distinguished Member of the ACM (the first to receive the classification in the state of Alabama) and a member of the first cohort to be named a Distinguished Contributor of the IEEE Computer Society. He is the Editor-in-Chief of Springer's Journal on Software and Systems Modeling.

Dr. Gray is co-chair of Alabama Governor Kay Ivey's Computer Science Advisory Council. He served on the Education Advisory Council of Code.org and is the co-chair of the College Board's Development Committee for the AP CS Principles course. His passion is advancing K-12 computer science opportunities throughout Alabama and the nation for both students (summer camps, various contests, research mentoring)

and teachers (professional development for teaching computer science in all of K-12; he has trained over 2,600 Elementary teachers and through a grant from Google, initiated an online course that prepared over 2,100 high school teachers across that nation for the first year of AP CS Principles). All of these efforts are founded on the need to diversify and broaden participation in computing by offering opportunities for all students. For example, he coordinates the NCWIT Aspirations in Computing awards for young high school women and is the PI for the NSF-sponsored LEGACY project that prepares Black high school girls for the AP CSP course. More information about Dr. Gray, including links to an extended resume/CV, can be found at http://gray.cs.ua.edu

Prof. Martha Escobar, Oakland University

Dr. Martha Escobar received a Bachelor's in Psychology from Deusto University (Spain) and a Master's and Ph.D. in Cognitive and Behavioral Science with specializations in Statistics and Behavioral Neuroscience from the State University of New York at Binghamton. Dr. Escobar joined the Auburn University (AL) Psychology Department in 2002, where she held the rank of Associate Professor. She joined the Oakland University (MI) Psychology Department in 2015, and currently holds the rank of Professor of Psychology. Her research focuses on learning and memory mechanisms across different species, animal models of cognitive dysfunctions and their treatment, effects of environmental contaminants on prenatal development, and the effects of cancer treatment on cognition. More recently, her interests have focused on how social variables, such as socioeconomic status and environments that offer low enrichment opportunities, impact cognition and educational outcomes. Her research efforts have led to multiple NSF and NIH multi-institution awards, in excess of $20M. She has received several mentoring and teaching awards, and directed the Auburn University Psychology Teaching Training program, which produced many nationally-recognized instructors.

Dr. Kathleen C Haynie
Noelle G. Mongene, Oakland University

is a doctoral candidate in Experimental Psychology at Oakland University. Her research interests include broadening participation in STEM and STEM identity, particularly among Native American and Black women.

Yasmeen Rawajfih, Tuskegee University

The Alabama LEGACY Project: A Peer-learning Community Model to Provide AP CS Preparation and Career Awareness for Black Young Women (NSF ITEST)

<author names removed for anonymous double-blind submission>

Abstract

Low participation of Black Americans in Computer Science (CS) careers is often attributed to a lack of "preparatory privilege," encompassing the unavailability of resources, experiences that build content knowledge and associated skills, and role models. The impact of this goes beyond academic proficiency; pursuing opportunities and career paths that are not easily available in one's community signals a departure from shared norms, which can have a deleterious impact on interest and persistence in STEM. This poster summarizes our NSF-funded (ITEST) multi-year project, called LEGACY, which targeted one of the communities most underrepresented in computing (Black young women), providing them with physical, academic, and social resources to overcome the lack of preparatory privilege, while building awareness of CS and realizing their potential for participation in CS and other STEM-related occupations.

Introduction

Careers in Computer Science (CS)-related areas represent many of the best-paid jobs in the nation. Yet, Black Americans comprise less than 5% of the workforce at the most popular U.S. software companies, with Black American women occupying less than 1% of those positions [1]. LEGACY stands as a groundbreaking program that educates young Black female high school students in CS in a way that is unique to Alabama, yet eminently worthy of larger-scale adoption and adaptation.

The LEGACY project recruited four cohorts (94 Black young women from 29 High Schools) for year-long preparatory experiences to promote their success in the College Board AP CS Principles (AP CSP) course and exam. Residential summer institutes at the University of Alabama (UA) and Tuskegee University (TU) immersed students in inquiry-based and culturally-responsive project-based AP CSP activities facilitated by three highly experienced Black women. The three teacher-facilitators and CS undergraduate near-peers (also Black women) mentored these students as they explored CS concepts, acquired core computational thinking practices and developed AP CSP Create Performance Tasks. Intertwined with its academic activities, LEGACY created a peer community of Black young women CS learners. Interactions with Black women CS professionals added to the role-modeling opportunities for the LEGACY students, building their sense of belonging and CS/STEM career awareness. Students also received resources to mitigate preparatory barriers. Drawing on LEGACY's collaborative network, participants engaged with successful Black women speakers from industry, academia, and government, as well as STEM learning experiences in various on-campus labs. Monthly virtual webinars and social media maintained this collaborative network throughout the academic year, as students completed the AP CSP course in their home high schools. The AP CSP curriculum is based on equity and inclusion as the course's primary goals.

In this poster, we summarize the key components of LEGACY and our core evaluative findings, providing lessons learned and suggestions for others who desire to explore similar models grounded in culturally-relevant principles to support successful CS and STEM education.

Core Results of the NSF ITEST LEGACY Project

The College Board's AP CSP curriculum is based on equity and broadening participation as the course's primary goals. In the first three cohorts of LEGACY (2019-20, 2021-22, 2022-23; suspension of the program for 2020-21 due to the Pandemic), 71.8% of students obtained a qualifying score (3 or above), which is higher than the 2022 National passing rate of 63.3% [2] (see Figure 1 and [3] for data from Cohort 1). This suggests that LEGACY's preparatory model promotes deep learning of CS concepts, culminating in stellar performance in the AP CSP exam. Students exhibited significant gains in computational thinking (developing computer programs and using pattern matching to solve computational problems), identification with CS, and desire to pursue careers that are computing-based. Follow-up interviews with past students currently in college revealed that a significant number of LEGACY alumnae chose to pursue STEM careers, and credit their participation in LEGACY with giving them the confidence to persist in their chosen college major despite encountering challenges.

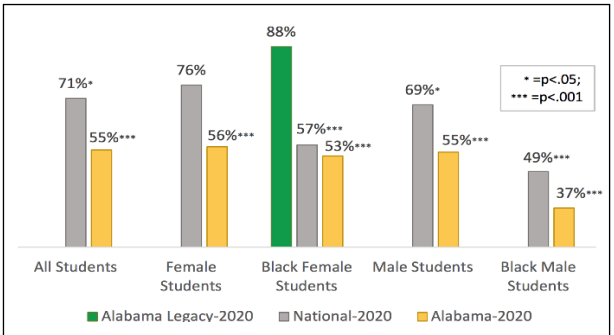

Figure 1. LEGACY Cohort 1 AP CSP qualifying rates

More information about the LEGACY project can be found at <double-blind removal, added if poster is accepted>

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