Increasing the Participation of African American Male Students in STEM

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Scientia

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Despite recent efforts aimed at increasing diversity in STEM-related fields, many communities are still largely underrepresented in these disciplines, including African American students and professionals. Not only is this unfair on individuals who may ultimately miss out on rewarding STEM careers, but it also deprives the STEM workforce of talented minds, and the innovation that a more diverse community could achieve. **Dr Terry L. Mills** and **Dr J. K. Haynes**, two professors at Morehouse College in Atlanta, have created the John H. Hopps Jr. STEM Education Research Program, an academic intervention designed to increase the participation of African American men in STEM degrees.



Cultivating a Diverse and Inclusive STEM Community

In recent years, institutions and educators worldwide have been trying to make STEM disciplines more inclusive and diverse, by offering academic support, funding, and resources to students and professionals from underrepresented groups. These initiatives can be highly valuable, as they can help to diversify and enrich STEM fields that have so far been primarily pursued by white males, while also supporting the professional development of talented young scientists.

Some projects aimed at diversifying STEM-related fields have achieved promising results, but there is still a long way to go before all scientific disciplines become fully diverse and inclusive. In the US STEM community, Native American, African American and Hispanic professionals are particularly underrepresented due to myriad factors, including bias and discrimination, limited access to quality education, poverty, and a lack of role models.

The salaries of STEM-related professionals are often significantly higher than those of non-STEM workers, which means that Native American, African American or Hispanic students might be missing out on valuable job opportunities. Even within the STEM workforce, studies suggest that many African American, Hispanic, and female workers on average hold less lucrative STEM-related positions.

By diversifying STEM-related fields and promoting the inclusion of students from underserved groups, educators can ensure that the talent of Native American, African American, Hispanic, and female scientists or engineers does not go to waste and is rightfully valued. Moreover, a more diverse workforce could significantly enrich STEM disciplines, bringing together a variety of different perspectives and



experiences to solve problems more dynamically and creatively, driving greater innovation.

Dr Terry L. Mills and Dr J. K. Haynes, two professors at Morehouse College, have been working on projects aimed at broadening the participation of African American students and professionals in STEM-related fields for several years. Recently, they created a new academic program called the John H. Hopps, Jr. STEM Education Research Initiative,



which was designed to promote the early engagement of undergraduate STEM students in research related to their field of interest. 'Our students will enter research laboratories with a framework for developing hypotheses and testing them,' says Dr Haynes. 'When undergraduate students have authentic research experiences, it is the most powerful means of developing their problem solving and critical thinking skills, which are key goals of a liberal education.'

The Program

US national reports have found that less than half of the students who choose to pursue an undergraduate degree in STEM-related fields end up graduating. Most STEM dropouts occur during the first two years, with some students abandoning college entirely and others switching to a non-STEM related major.

Among the main reasons that students report for abandoning STEM-related studies are uninspiring courses and instruction methods. Therefore, the main mission of the John H. Hopps, Jr Education Research initiative is to increase the engagement of African American students enrolled in STEM-related undergraduate courses. 'The John H. Hopps, Jr. STEM Scholars Program is named in honour of the former National Science Foundation Director of Materials Sciences and Morehouse College Provost; and builds on previous successful efforts to increase participation of African American male students in STEM disciplines,' says Dr Mills.

The program has been running for two years, so two groups of undergraduates are enrolled in it. To identify students who are eligible to participate in the program, Dr Mills and Dr Haynes use the College Student Inventory Survey, a test that contains an indicator called 'predicted academic difficulty'. In other words, the researchers hope to increase the engagement of students that might be finding STEM-related courses challenging. Eligible students who confirm that they wish to participate in the program also receive a small annual stipend to purchase books and academic supplies.

A Proactive and Multi-disciplinary Program

The John H. Hopps, Jr. STEM Scholars Program is based on a proactive approach, which begins in the first year but assists STEM students throughout the first three years of college by increasing their engagement levels. The program comprises several components that are collectively meant to improve the students' interest in their courses, which could in turn boost their self-efficacy and academic performance. These components include participating in interdisciplinary linked courses, field trips to national laboratories, expert advisement and participation in authentic research experiences.

During the first two years of college, students participate in two interdisciplinary linked courses that bridge two seemingly unrelated disciplines, such as chemistry and social sciences. 'The activities of our intervention project include faculty development of linked interdisciplinary courses, such as our Chemistry + Social Problems course that is presently being taught,' says Dr Mills. 'During this course, the students examine STEM-related topics in connection with social issues. They might, for instance, look at the chemical components of opioids and the social construction of addiction.'

Another interdisciplinary course offered by the program combines algebra with music and culture, paying close attention to the links between geometric sequences and musical notations. As part of this course, the students are also invited to participate in a workshop where they are taught how to build an African thumb piano called a Kalimba.

'The most important problems – for example reducing climate change and combatting infectious diseases – require interdisciplinary thinking,' says Dr Haynes. 'Individuals who come to the college to recruit students for graduate programs and the workforce tell us that they are looking for students with broad training across the sciences and humanities.'

In addition to taking part in these engaging activities, the students also receive academic support from mentors and advisors. In their first year of college, they meet with their advisors every two weeks, to discuss their progress and impressions.

In their second year, the students enrol in an intermediate level linked course and participate in a summer research project at an external institution. In their third year, the students participate in the Hopps Scholars symposium, where they present their research findings to other students and scientists. In the final year, students are also asked to take part in mentoring workshops designed to prepare them for graduate studies and to take the GRE examination – the most widely accepted test for graduate admissions.



Initial Lessons Learned from the Program

So far, Dr Mills and Dr Haynes have been unable to evaluate the program they created to the extent that they had hoped, as the outbreak of COVID-19 limited their ability to thoroughly observe and interview participating students. In addition, the pandemic forced them to adapt some of the program's events and initiatives.

'Last year, and continuing into this year, our processes and progress has been affected by COVID-19, and we have attempted to identify workarounds,' says Dr Mills. 'For example, initially we planned to make a site visit to the Oak Ridge National Labs in Tennessee. Since that was not possible, we were able to arrange virtual guided tours of the major labs and facilities. The virtual tour allows us to access areas that we would not have been able to in a physical tour.'

The researchers, in conjunction with the evaluation team, are assessing the effectiveness of the John H. Hopps, Jr. STEM Scholars Program. This assessment focuses on four main outcomes – namely the effects of the program on the participating students' academic performance and development, the quality of the courses, events and mentoring activities offered by the program, and the program's overall impact on the college's resources.

'Recently, our external evaluation team conducted interviews with a small group of Hopps scholars, interdisciplinary faculty partners, and project administration,' says Dr Mills. 'Responses from students revealed that the linked courses are indeed having a positive impact on learning.'

In the interviews, many students reported that they developed a deeper understanding of concepts, because they were embedded within the broader context of society. They also reported an appreciation for the interconnectedness of different fields, and were able to identify unapparent ethical issues within a given field. Hopps scholars also mentioned positive effects beyond enhanced learning, including greater collaboration among students, the development of better social skills, and increased interest in expanding their academic goals such as adding a minor degree. The evaluation team also asked instructors to describe their own perceptions of the linked courses. One teacher mentioned that it increases students' interest in the material and gives them a 'passion for how they can apply concepts to their careers and make an impact on the world.' Teachers also mentioned that the collaborative nature of the linked courses is particularly good for students who may need some peer-scaffolding, because the students tend to support each other – creating a sense of community and interpersonal connectedness.

Instructors were also asked to describe how their involvement with linked courses has changed their own pedagogical approach. All teachers who were interviewed mentioned that it has reinforced their belief in the importance and positive effects of interdisciplinary learning.

Overall, the responses from instructors and scholars provide promising initial evidence that the program is indeed increasing students' levels of engagement and depth-of-learning – an important intended outcome for the project.

The Program's Future

Seventy-six students are enrolled in the John H. Hopps, Jr. STEM Scholars Program. The proactive approach developed by Dr Mills and Dr Haynes could help to significantly enhance STEM education at Morehouse College, reducing drop-out rates and increasing the engagement of young African American students who are more at risk of changing or abandoning their studies than other groups of students.

If the results of the evaluations they plan to carry out are encouraging, the researchers would ultimately like to standardise their proactive approach, so that it can also be adopted by other institutions. This could considerably contribute to nation-wide efforts aimed at increasing the participation of underserved groups in STEM-related fields.

Future research examining the John H. Hopps, Jr. STEM Scholars Program's outcomes could also shed new light on some of the factors influencing student retention and engagement in STEM-related courses. This could ultimately inform the development of other academic programs aimed at increasing the participation of underrepresented students in STEM courses, reducing drop-out rates and increasing diversity in the STEM community for a stronger and more innovative workforce.

As Dr Haynes concludes, 'We believe that the research experiences and the preparation that we are providing students on how scientists do their work before they begin doing research is an invaluable component of our program.'





Meet the researchers

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Dr Terry L. Mills is a Research Professor at Morehouse College. He holds a BS in Information Systems, an MA in Behavioral Science from California State University, and an MA in Sociology and a PhD in Sociology/Gerontology from University of Southern California. Before he started working at Morehouse College, Dr Mills held positions at John Carroll University, University of Colorado - Boulder, and University of Florida. His past research focused on different areas of sociology, psychology, and education. Over the course of his career, Dr Mills participated in many projects aimed at increasing diversity in STEM-related fields and broadening the participation of underrepresented groups.

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E: terrymills226@gmail.com W: https://www.morehouse.edu Dr J. K. Haynes has been the David Packard Professor in Science at Morehouse College since 1985. During his tenure at Morehouse, he served as Director of the Office of Health Professions, Chair of the Department of Biology and Dean of the Division of Science and Mathematics. He was also an Adjunct and Visiting Professor of Physiology at Brown University. Dr Haynes obtained a BS in Biology from Morehouse, a PhD in Developmental Biology from Brown University, and completed postdoctoral work at Brown and Massachusetts Institute of Technology (MIT). Much of his research career was spent studying Sickle Cell Anaemia, but his recent work has focused on increasing the participation of underrepresented groups in STEM and promoting reforms in STEM education.

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