According to the National Center for Science and Engineering Statistics, the number of engineering bachelor degrees awarded to females increased from 0.4% to 19% from 1966 to 2012 respectively. On the surface this seems to be a giant leap forward, however, this victory is eclipsed by the seemingly entrenched demographic disparity. Women constitute more than half the general population but is grossly under-represented in the engineering profession. African Americans represent only 4% of the engineering workforce while representing 13% of the population. There is still a need to further increase female and minority representation in the STEM enterprise and institutions of higher education must seek ways to address the present disparity by implementing ways to remove barriers to access and retention. In addition, the national shift towards knowledge-intensive economic activity, and the anticipated retirement of STEM professionals in the government sector in the near future, continue to increase the need for well-trained individuals in these fields.

When certain higher education researchers suggest that the issue of female and minority under-representation in STEM resides primarily on the poor academic mathematics/science preparation of minority students, and their lack of interest and motivation toward STEM, without, in most cases, changing the quality of their learning environment, the outcomes have not produced positive results.

The Bureau of Labor Statistics had identified the shortage of engineers and scientists at the turn of the century and recommended increased production take place if the U.S. is to be competitive in global markets. Agencies such as the National Science Foundation, the National Institutes of Health, the American Association for the Advancement of Science and many others, have increased their focus on programs and initiatives to address the current shortage and the potential damage it will create for industry and the nation at large. The largest untapped segment of the population that exists to educate in the STEM disciplines are minorities, (African American, Hispanic American and Native Americans) and women.

However, the notion still prevails that the mission of higher education is one that focuses on “fixing” the deficits in its students. Some college professors still view minority students as academically at risk, lacking abilities, unmotivated and
culturally deprived, instead of seeing them as capable, motivated and resilient learners able to build upon their cultural strengths. Much of the statistical information published regarding minority students’ performance looks more at the mechanism of how the population performs using the norms established by their non-minority counterparts. In more recent years, engineering and science educators have begun to peel away the previous misconceptions of minority student’s performance and actually capture those skills that are natural and can be enhanced to allow them to perform at the very highest levels.

With this type of emphasis from the government, industry and higher educational institutions, there are a growing number of initiatives that are now strategizing methods to stop the minority STEM brain drain to other disciplines and investigate newer methodologies to increase the quality and quantity of under-represented students to become the scientist for the next millennium. Some of the new strategies include: first year seminars, internships, learning communities and capstone projects. These are typically implemented utilizing the classic fixing of the “broken student” methodology. There are currently educators across the country that are researching and testing methods that show the true understanding of the causative factors that impact both cognitive learning and self-directing competencies will facilitate scientific learning for all.

During the last 20 years coordinated efforts across the country have convened and established metrics and environments that have proven successful including: 1. the introduction of more esoteric topics in STEM to create interest in future scientific advances particularly in middle schools, 2. Introduction of undergraduate students to research as soon as possible, 3. Understanding the common phobias and discontinuities for underrepresented students, (e.g., do they belong in this environment), 4. Pedagogical approaches that utilize the common knowledge of the students and translates abilities to more sophisticated topics, 5. Introduction to graduate students of similar background, 6. International research opportunities for a more global perspective of their discipline.

This book is a compilation of the above-mentioned efforts, detailing successes, pitfalls and future direction to continue the current momentum. It will provide strategies for educators and policy makers who are addressing these issues on a daily basis. Congratulations.

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Stephen R. Cox, Ph.D., is the Project Director of the Greater Philadelphia Region Louis Stokes Alliance for Minority Participation (LS AMP) headquartered at Drexel University, Pennsylvania since 1990. The mission of LS AMP is to substantially increase the quantity and quality of African American, Hispanic and Native American students receiving baccalaureate degrees in science, technology, engineering and mathematics (STEM), and subsequently, entering graduate school to attain doctoral degrees. An engineer and physicist by training, Dr. Cox has spent the last three decades advocating for increase participation of women and minorities in STEM. His many honors and awards have included; Benjamin Benneker Legacy Award for African American Inclusion in Science, Men Making a Difference in the African American Community, the Equal Access to S.E.M Education through creative and Innovative Program Development and Foundation Award by the National Organization for the Advancement of Black Chemists and Chemical Engineers for the advancement of STEM in the Delaware Valley.