



Undergraduate Research - A Key To Advancing Interest In STEM

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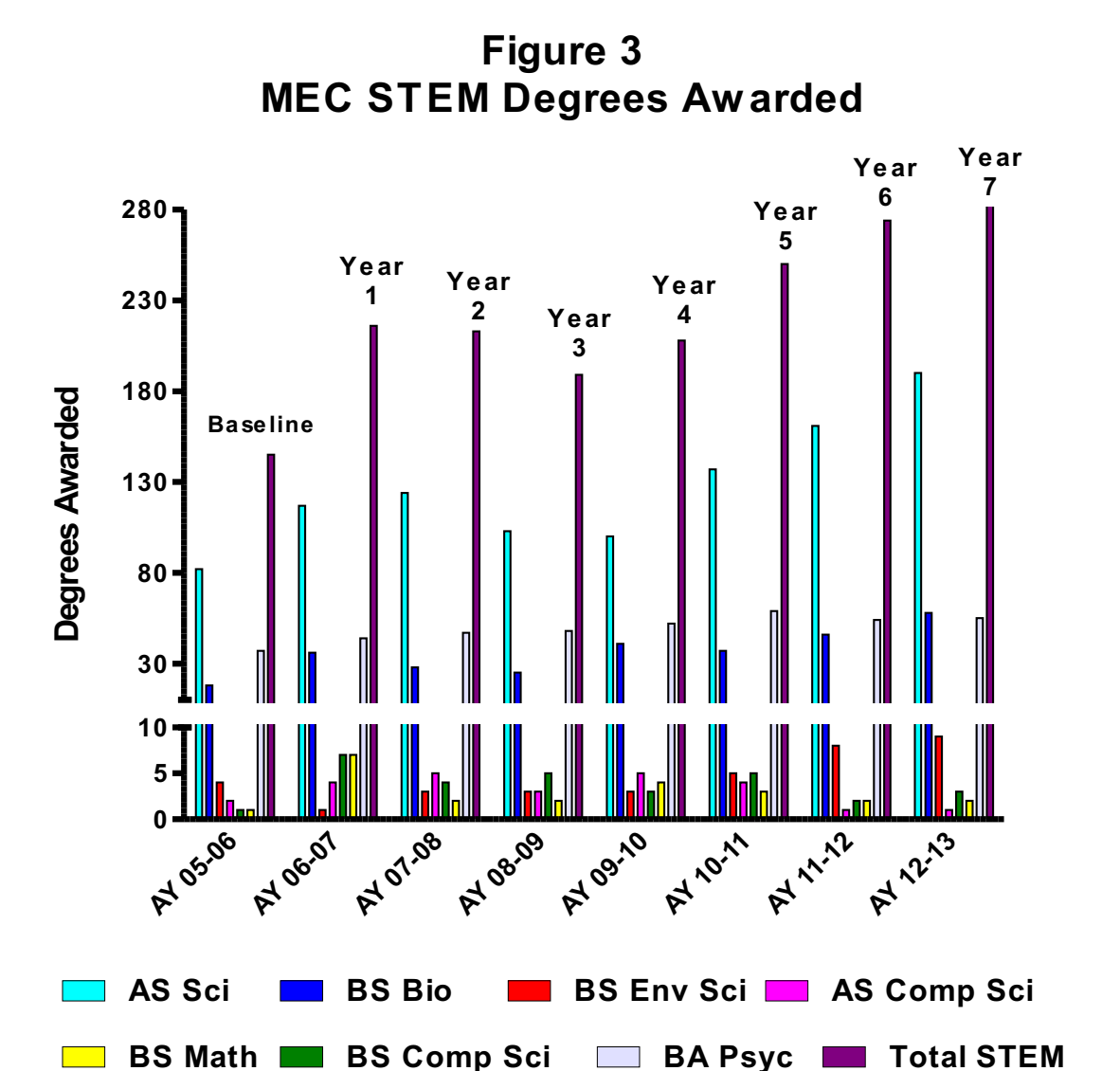
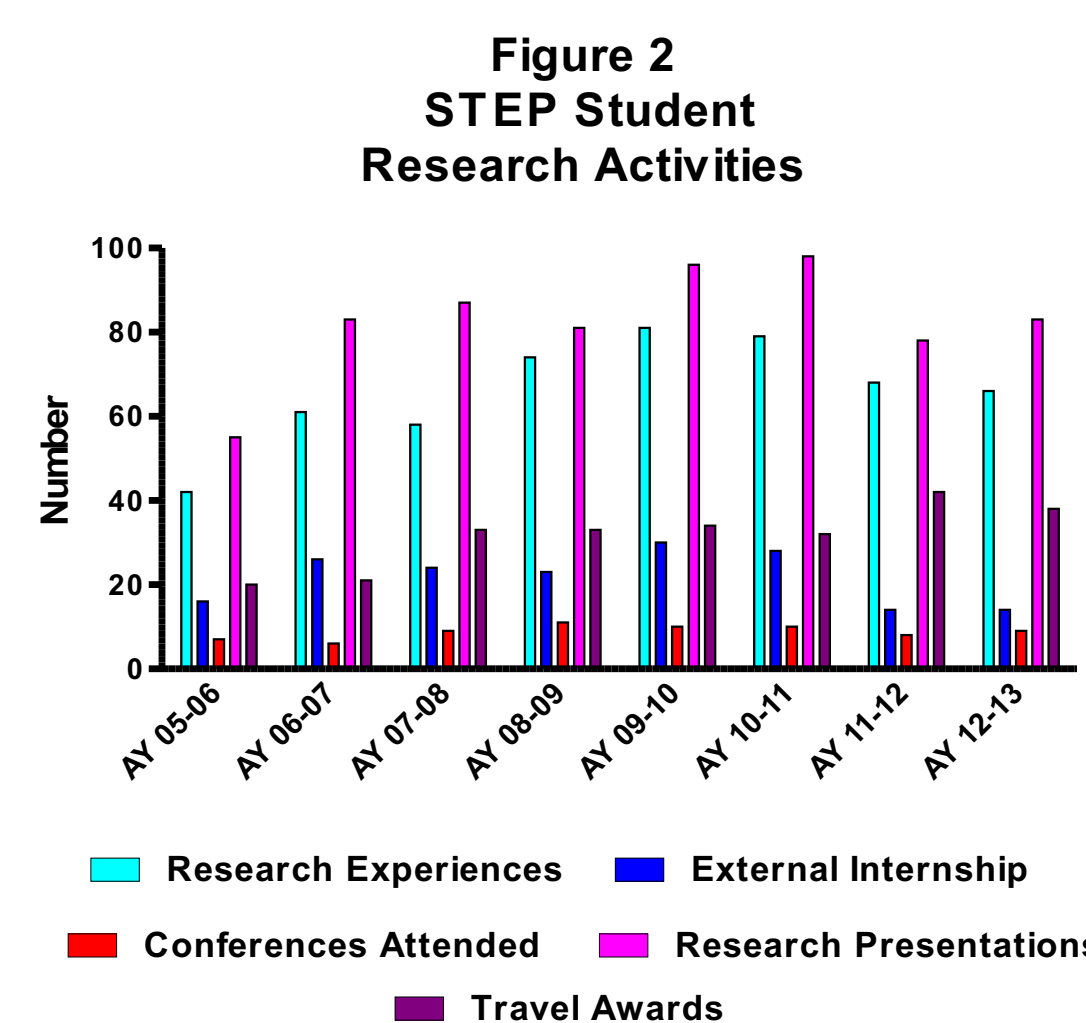
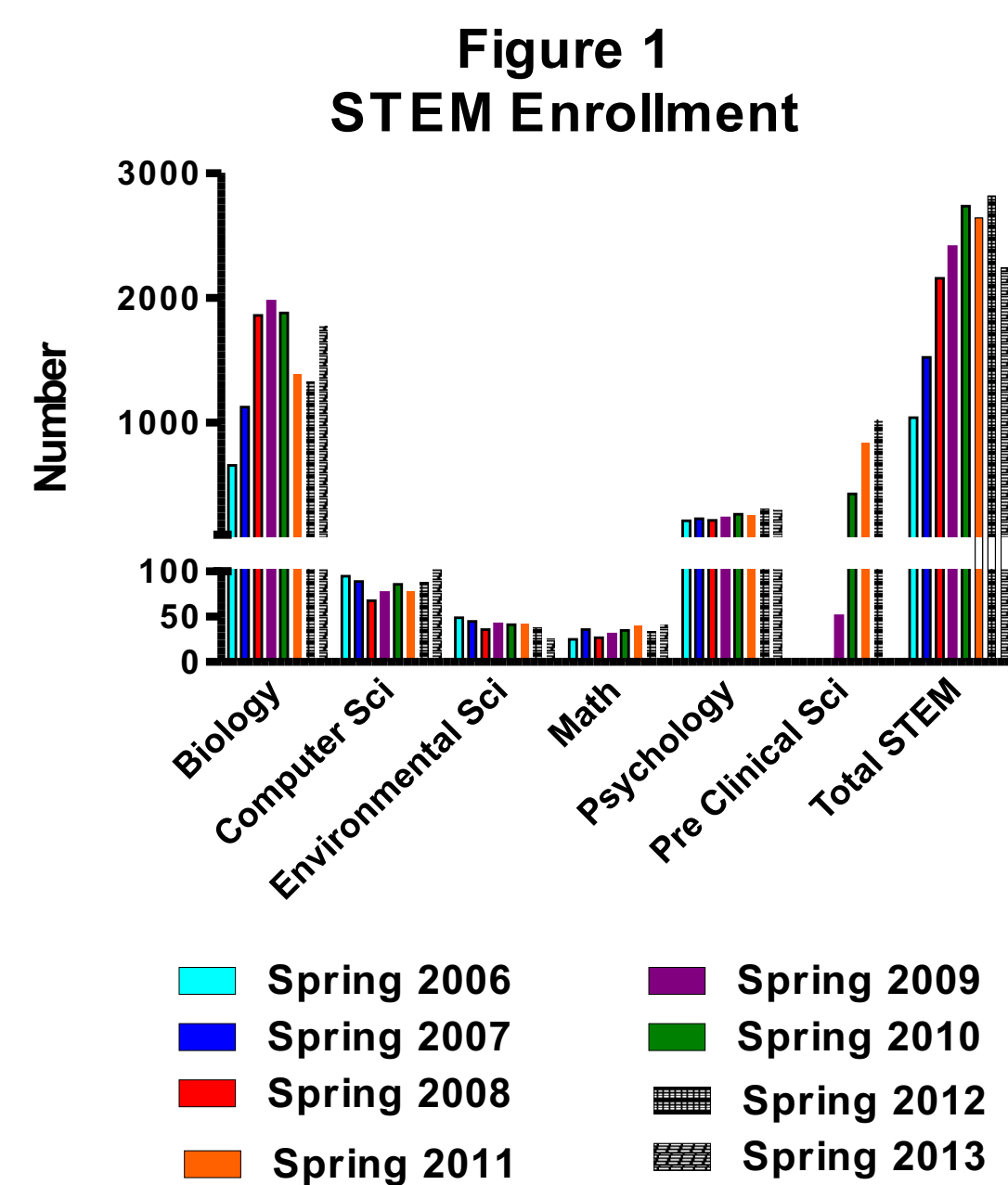
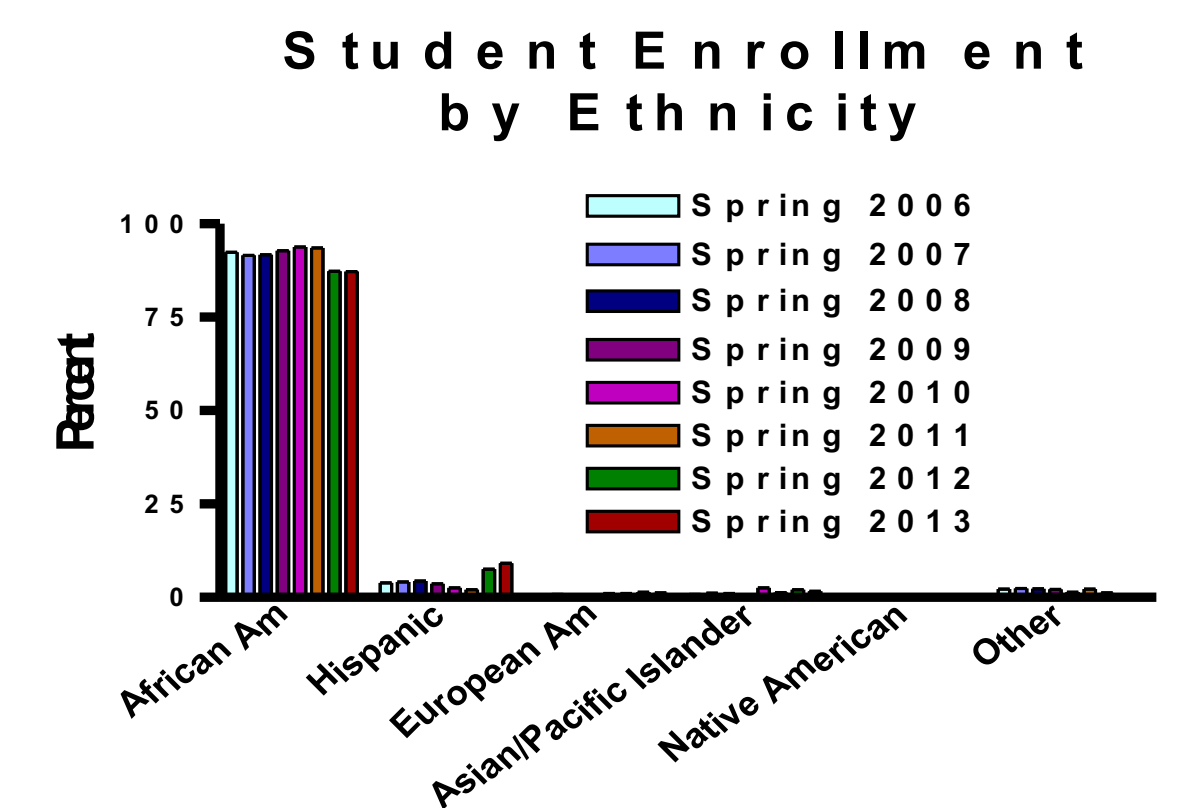
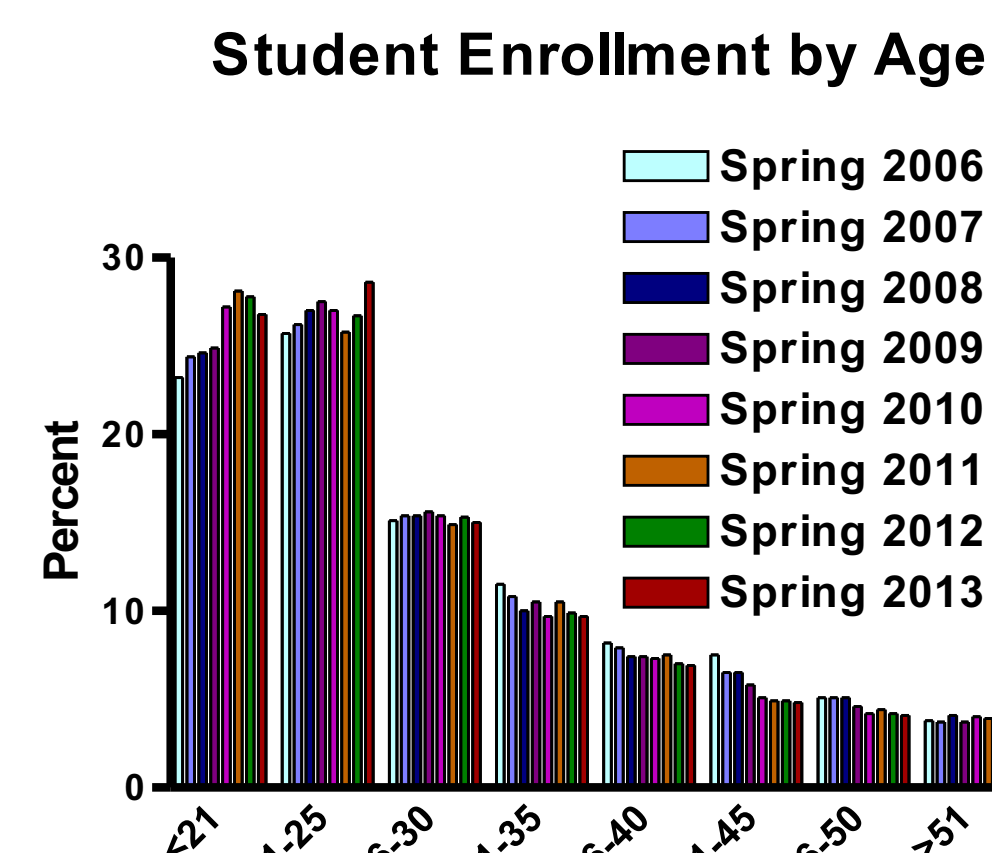
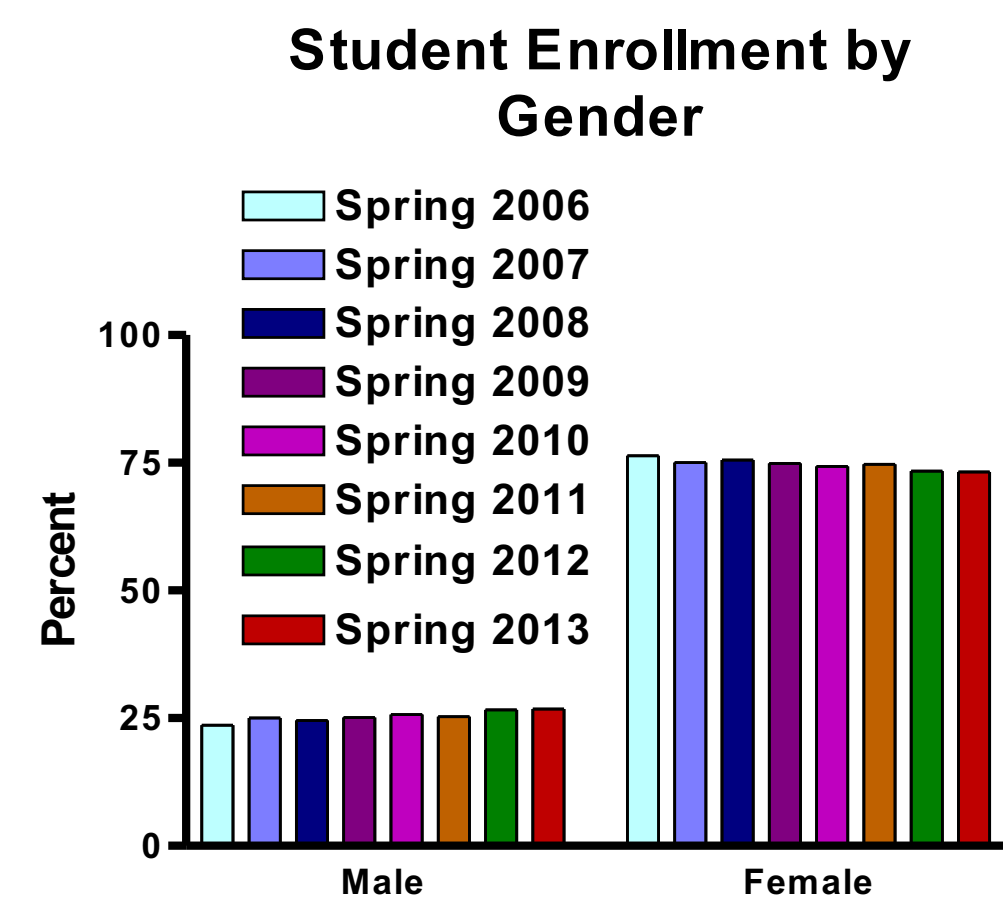
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ABSTRACT

Promoting and providing opportunities for undergraduate to participate in research projects is a successful strategy of increasing undergraduate student interest in STEM programs. Here at Medgar Evers College with the support of grants from NSF (STEP Into Science Program) and New York State (Science CSTEP Program) we designed activities to increase the number of students earning BS degrees in Biology and Environmental Science. The goals of our programs were to: recruit new students and non-STEM students into Biology or Environmental Sciences; improve retention by providing academic, financial and mentoring support; foster integration of research and technology to better equip majors to be successful applicants to graduate/professional programs; and increase the number of students graduating with BS degrees. We use peer recruiters to attract more high school, transfer, and non-science college students into STEM majors and place emphasis on undergraduate research experiences to increase the quality and retention of science majors through their BS degree. Since the inception of the program, STEM enrollment more than doubled. Our program evaluations consistently showed that a key factor in our successful recruitment and retention was student involvement in undergraduate research activities. Over the last 10 years the number of majors actively engaged in research has risen more than 90% with a concurrent increase in student research presentations at scientific conference, and an 87% increase in the number of students receiving external research internships and travel awards to attend national conferences. STEM graduates have also increased and many of them are continuing on to Masters and Doctoral programs in STEM and hopefully will ultimately enter rewarding careers in the science enterprise.

Medgar Evers College Student Demographics

Medgar Evers College (MEC), founded in 1970, is situated in the Crown Heights section of Brooklyn, one of the largest, most densely populated and ethnically varied sections of the borough. The college offers both Associates and Baccalaureate degrees and serves a diverse student body representing all areas of New York City, especially the surrounding Brooklyn community.



Strategic Improvement Plan and Program Goals

Aggressively recruit students from non-STEM areas

Improve retention and increase the number of students graduating with B.S. degrees in Biology or Environmental Science who enter careers in the science enterprise

Summer Academic Immersion Program

Cooperative Learning/Tutoring Program

Strengthen the curricula of both academic departments by fostering the integration of research, technology and academics to equip students with the skills and knowledge necessary to be successful applicants to graduate/professional programs

Visits to graduate schools, research centers and museums, local and national science conference participation, research methods and instrumentation courses, increase and enhance on-campus research opportunities, promote external summer research internships

Monitor and assess short-term and long-term program effectiveness, make adjustments when needed and disseminate findings

Track student progress through the program and beyond

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Progress to Date

Summary

- Implementing successful recruitment strategies is a major barrier in attracting more college students into STEM majors. Often it's assumed high school graduates, especially women and URM groups, avoid choosing STEM programs because their scores indicate they are ill prepared for the rigors of college mathematics and science courses. However studies have found that African American and Hispanic college students with high grade point averages and SAT scores above 600 still may not pursue STEM majors for reasons including poor teaching in STEM courses, lack of encouragement from teachers or parents and self-perception of their own inability to be successful in STEM majors.
- The Peer Recruiter Initiative has been a popular and engaging strategy for both recruiters and perspective majors. Upper level science majors are the best science role models to recruit the population being targeted. They can give personal insight on how they handled degree requirements, and hopefully entice students by relating their research and other enrichment experiences as well as future goals. Recruiters benefit as well as they gain in pride and self-confidence, while conveying their science accomplishments and experiences to their peers.
- The inability of high school teachers to properly prepare students for the rigors of college science is a serious concern. It is estimated that 29% of high school math teachers and 23% of high school science teachers never majored or even minored in these subject. The percentages are even higher for inner city school systems like NYC.
- A major factor in student success and retention is involvement with faculty. When students have frequent friendly interactions with faculty members, their development of intellectual competence, sense of confidence, autonomy, interdependence, purpose and integrity are often enhanced. Other reports have shown increased informal student-faculty interaction results in satisfaction with the overall quality of education and persistence in obtaining the degree.
- A supportive science-learning environment involves more than just coursework. One needs to afford students opportunities to entice them to persist by informing them of the latest cutting-edge scientific advancements, exposing them to exemplary science professionals and high-level science career opportunities, and providing them with experiences demonstrating the value and do-ability of scientific research.
- Integrating research with academics is a major focus. The project made significant progress in getting more science majors involved, including freshman and sophomores, in both on-camps and external research projects. Students value and appreciate the opportunities to work on research projects and there is great STEM retention value in engaging students in the practice of science and all the other activities that go along with practicing science, as early as possible.
- Student responses to program questionnaires and activity evaluations consistently indicate that their participation on research projects and having opportunities to travel to conferences, scientific sites and various research universities are major highlights of the program and their undergraduate experience at MEC. These enrichment activities generated greater science interest and science self-confidence in the majors than if the program had been designed to narrowly focused on purely academically based interventions and strategies.
- Undergraduate research helps promote career pathways for URM by increasing retention rates of URM undergraduates, increasing the rate of graduate education of URM students and increasing STEM graduate school enrollment for URM and women.
- Getting undergraduate science majors to aspire to and be competitive for admission into STEM graduate programs is essential if they are to be properly prepared for rewarding careers in the science and technology enterprise.
- In 1997, 64% of black scientists in the U.S. labor force had a B.S. as their highest degree compared with 57% of all scientists and the percentage of all doctoral scientist and engineers in the U.S. of African descent was only 3%. While some progress has occurred over the last decade, recent data indicate that the number of doctoral scientist and engineers in the U.S. of African descent had barely risen, to just over 4%.
- A quote from Reaching the Top, the 1997 report of the National Task force on Minority High Achievement, states: "Until many more URM from disadvantaged, middle class, and upper class circumstances are very successfully educated, it will be virtually impossible to integrate our society's institutions completely, especially at leadership levels. Without such progress, the United States also will continue to be unable to draw on the full range of talents in our population during an era when the values of an educated citizenry have never been greater."
- This observation remains current and provides much of the drive and momentum to the initiative at Medgar Evers College.