



## **Increasing Recruitment and Retention of Minority Participants in STEM Fields**

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### **Abstract**

*A recognized need persists in higher education to increase minority participation and to diversify science, technology, engineering and mathematics (STEM) fields. Demand for graduates in science, technology, engineering, and math as representatives of underrepresented groups is high, as these scholars have the potential to provide a unique perspective and approach in addressing research questions while forging paths of equability, inclusivity, and accessibility for the future. This study aims to examine what strategies have demonstrated success in both recruitment and retention of underserved student populations and to assess what methods show promise and creativity for future implementation.*

**Keywords:** *STEM, minority, underrepresented, retention, recruitment*

### **1. Introduction**

STEM fields offer numerous degrees across various interdisciplinary subject areas. However, even with the expressed need for broadening representation in STEM fields, institutions of higher learning have failed to meet market demand for providing qualified graduates. Current issues in systemic racism and a global pandemic that magnifies racial, social, and political differences seem to be exacerbating this gap. Past studies have shown that strengthening and integrating social and academic support networks can have positive outcomes for student success [1, 2]. Targeted engagement that starts before higher education and involves strengthening community ties can play a pivotal role. Building an academic framework reinforced with financial backing and developing programs that serve to bridge academic gaps will support students that are being left behind. By identifying methodologies that work, we hope to shine a light on a path forward that celebrates the strength present in our entire populace and ensures holistic participation of all groups to innovate, research, and create for the future.



## **2. Why we need more diversity in STEM education**

Despite substantial advances and extensive efforts to bridge the divide, significant gaps remain between the educational attainment of minority students and their majority peers, particularly in the STEM fields [3]. Diversity is crucial for our economic growth as well as global competitiveness. STEM jobs are projected to increase by one million in the United States in the next decade [4]. In the workforce, companies need to reflect the diversity of the communities they serve in order to meet or anticipate future needs, but STEM fields continue to underrepresent large portions of the population.

## **3. Effective strategies for recruiting and retaining minority students in STEM fields**

By introducing STEM education for females and ethnically diverse students at an early age, it is possible to pique students' interests and encourage them to engage in STEM activities. Successful implementation of STEM programs will enable students to realize the numerous benefits and value of engaging in STEM education which is essential for all students. Additional guidance, role models, and support may serve to encourage participation from minority students and females. Many of these students will be the first in their family to graduate from college, and these first-generation students often face unique challenges. As the culture for learning is strengthened and students are encouraged to excel in STEM activities, positive reinforcement combined with enthusiasm for STEM subjects is capable of resulting in increasing participation in STEM disciplines. As students build confidence and realize the value of engaging in STEM education, their interest in the area will grow and their determination for success will increase. When students can relate to the advantages of pursuing education in STEM fields and grasp the essential aspects of STEM learning, this will lead to intrinsic motivation and independently continue the learning process. A student's expertise and ability is often impacted by the influence of those around him or her as well as the degree of success achieved. By providing support to strengthen interest and expertise for STEM students who are attempting to acquire knowledge in these fields, the potential for success is realized.



#### **4. Examining recruitment and retention factors for minority students**

Engaging students and reaching out to recruit and retain minority students while keeping them on task and enthusiastic regarding their learning progress in STEM fields is tantamount to their success. Studies indicate that women as role models in the STEM fields are beneficial to recruiting and retaining women and girls in STEM disciplines [5]. Furthermore, same gender role models are helpful for females in contending with negative stereotypes that they may face or underperforming in their field [5]. Minority students and females benefit when educators provide substantial flexibility and adaptability in STEM curricular settings that is tailored to students' demonstrated interests while achieving specific curriculum outcomes. The cognitive development of learners and measurable attainment of goals and objectives is essential for ensuring that students continue to achieve and realize success. Quality educators have the capability to inspire and motivate their minority students to high ideals celebrating their accomplishments and encouraging them to continue their pathway to successful careers in STEM fields.

#### **5. Examples of best practices for diversity and inclusion in STEM education**

Innovations and best practices that focus on actively engaging and recruiting minority learners and challenging them to excel will empower students and ignite a culture that will enhance learning and enable students to reach their full potential. Successful practices demonstrate that financial support, mentorship, community support, and research experience are necessary for student success [6]. Recruiting and retaining STEM teachers is needed to allow these community leaders to serve as role models and strengthen successful involvement of minority students in STEM fields. Educators who serve as role models and ignite a passion in their students while communicating their enthusiasm for STEM curriculum will positively influence students. Successful STEM teacher recruiting and training workshops led by Society of Women Engineers professionals and college students have been developed through the Talented Teachers in Training for Texas program and describe valuable strategies for engaging quality STEM teachers [7]. These practices discuss implementing the following three distinctive recruiting experiences: the STEM Master Teacher Job Shadow, a STEM Day, and a NASA Aerospace Teachers Program. These programs are supported by a multiyear scholarship and mentoring program designed to invite preservice teachers into an authentic, sustained academic community of practice supported by high



levels of engagement with caring STEM practitioners [7]. Due to the multiplicity of educational opportunities and settings for learning, students are faced with myriad decisions regarding the best way to pursue a quality education and realize their goals. The outcome of these decisions for minority students is to pursue educational endeavors that fit with their unique learning style and allow them to thrive in their environment.

While academic preparedness in the math and sciences at the high school level has been found to be predictive of STEM enrollment and success at the college level [8], early intervention programs can help overcome some barriers imposed by socioeconomic factors and lack of access to academic rigor in the math and sciences early on [9]. At Boise State University, faculty realize that many students choose to enter STEM fields because their interest was sparked by participating in fun and exciting activities before they enrolled in college. In the E-Girls Program, girls in secondary school ages 14-16 have the opportunity to participate in a free overnight program designed to interest them in the field of engineering and provide workshops led by the Society of Women Engineers professionals and college students. These workshops include such topics as the Biomechanics of Footwear, Packaging and the Environment, Virtual Worlds with Alice, Solving Forensic Mysteries, Physics of Rock Climbing/Rope Walking, and A World of Career Choices [10]. Georgia Gwinnett College (GGC) School of Science and Technology hosts a summer STEM Academy to bolster participation of women and minorities in STEM fields. These enrichment programs for fifth through eighth grade students attempt to capture the imagination and pique interests of young scholars early to recruit students into math, science, and information technology. Georgia Gwinnett College, with more than half of students representing culturally diverse backgrounds, qualifies as a minority serving institution and seeks to meet student enrollment needs by hiring a diverse faculty that can serve to inspire and instruct. GGC also promotes mentor/student relationships in STEM through undergraduate research projects.

## **6. Conclusions and recommendations**

STEM education and disciplines are at the forefront of educational innovation and creative endeavors, and an increasing number of underserved populations can benefit from active engagement in the evolving structure of STEM fields. Not only will our students realize the achievement of personal goals, but by



promoting STEM education for minority students and females, an enhanced workforce in STEM will represent a more true reflection of the population. The process of transforming STEM education will require an integrated approach of providing support (both academic and financial), advising, research mentoring, bridge and early-intervention programs, and activities that strengthen community and campus ties. Strengthening STEM disciplines through recruitment and retention of minority students and women will create even more opportunities for growth and the realization of student aspirations. Minority students and females will make a significant difference in STEM classrooms by serving as the role models of the future. Future expanded studies are recommended that address the factors impacting recruitment and retention of minority students in STEM fields.

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