New Orleans JAZZED about Engineering Education

Paper ID #16454

Supportive Practices Used with Underrepresented Minority Graduate Students

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Supportive Practices Used with Underrepresented Minority Graduate Students

Abstract

Underrepresented minority graduate students confront various types of challenges while pursuing STEM graduate degrees. Thus, to ensure the successful completion it is important to identify and to implement supportive practices from underrepresented minority student perspectives as their representation is lacking in these programs. The objective of this research study is to provide information on the perspectives of underrepresented minority graduate students which can be used to develop a supportive model of practices that can help complete their STEM graduate programs. Survey instruments were used to gather data regarding underrepresented minority student preferences, experiences, and recommendations of supportive practices that help students to complete STEM graduate programs. The survey respondents were predominantly from the African American and Hispanic ethnic and racial background. The results of the surveys reveal common themes that support students, such as motivational factors, financial factors, and helping factors. These factors were specified by students' explanatory answers from open-ended questions, such as a focus on "long-term goals" as motivation. These research results can inform recommendations for supportive practices that can be implemented in STEM graduate programs to assist underrepresented minority graduate students in navigating and completing their graduate degree.

Introduction

The United States receives the greatest number of international students in undergraduate and graduate programs.[7] In 2012, about six out of ten foreign graduate students were specifically studying science and engineering with most arriving from China and India.[7] One year prior, 56% of doctorate degrees in engineering were earned by foreign students.[7] There are even fewer students that pursue graduate studies in STEM fields from historically underrepresented groups. For example, the National Science Foundation reports that an estimated 50% of Asian American or Asian students planned to major in a STEM field compared to 36% of African American students in the year 2012.[7] An undergraduate academic career in STEM is the first step necessary to pursuing a graduate degree in a STEM discipline. In one year of gathered national data, the National Science Foundation discovered that approximately 50, 396 White, non-Hispanic students are enrolled in a graduate program in engineering compared to that of approximately 4,172 Black students, 5,218 Hispanic students, and 344 American Indian/Alaska Native students enrolled in the same graduate program.[8] The disproportionate representation of underrepresented minority students in STEM graduate programs is a severe educational concern that requires research regarding supportive practices to ensure the success of this population of students enrolled in STEM graduate programs.

To ensure the success of graduate students in STEM fields, it is critical to provide information on the supportive practices used and lessons learned to all institutions with STEM graduate programs. Often the lack of knowledge regarding helpful practices, policies, or processes as well as a lack of awareness of effective strategies for success contributes to the many factors that hinder these graduate students from completing the program. The use of this information will be instrumental in ensuring that all students matriculate through the graduate school process and graduate with a sufficient amount of knowledge and expertise to ensure career viability and

success. Our research approach and results are advantageous as they provide the student's perspective on what is helpful and what can improve to be helpful for underrepresented minority graduate students.

The National Science Foundation reports that only 7% of professionals in STEM fields, such as Science and Engineering have obtained a doctoral degree.[6] As competition arises globally to build a strong STEM workforce, concern regarding STEM education has become a priority. Therefore, graduate programs preparing underrepresented minority students in STEM can contribute greatly to our nation's call for STEM professionals by implementing successful practices in preparing these students to enter the various fields of STEM.

The objective of this research study is to identify and to evaluate data regarding underrepresented minority graduate student perspectives in order to increase awareness of supportive practices used in STEM graduate programs that help students graduate. This team of research scholars is working with several graduate program sites to produce research findings that delineate which practices, procedures, and policies are effective from the perspective of current and former underrepresented minority graduate students. These student perspectives and experiences guided this research on investigating the efficacy of many practices. As a result of successfully completing the project goals, a model from the graduate student perspective defining various practices, procedures, and policies proven to support the success of broadening participation efforts and underrepresented minority student success in STEM graduate education programs will be established. The establishment of the model is significant and will allow for national dissemination and improvement of program support for underrepresented minority graduate students in STEM fields.

Methodology

Participants

Approximately 91 students (*N*=91) nationally from 16 universities (*Figure* 1) primarily in the age range of 22-32 years participated by completing the survey instrument used in this study. Students were from diverse ethnic and racial backgrounds (*Figure* 2) and diverse classification statuses (*Figure* 3).

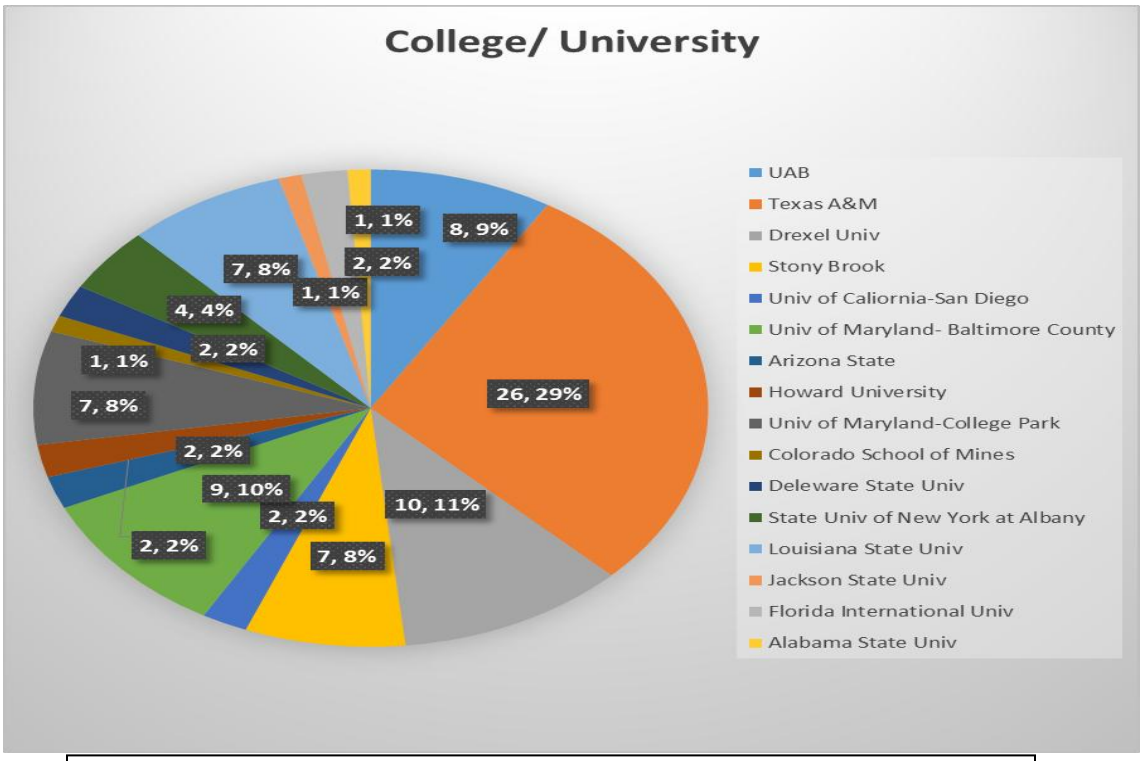

Figure 1 A graph representation of the universities that student participants attend.

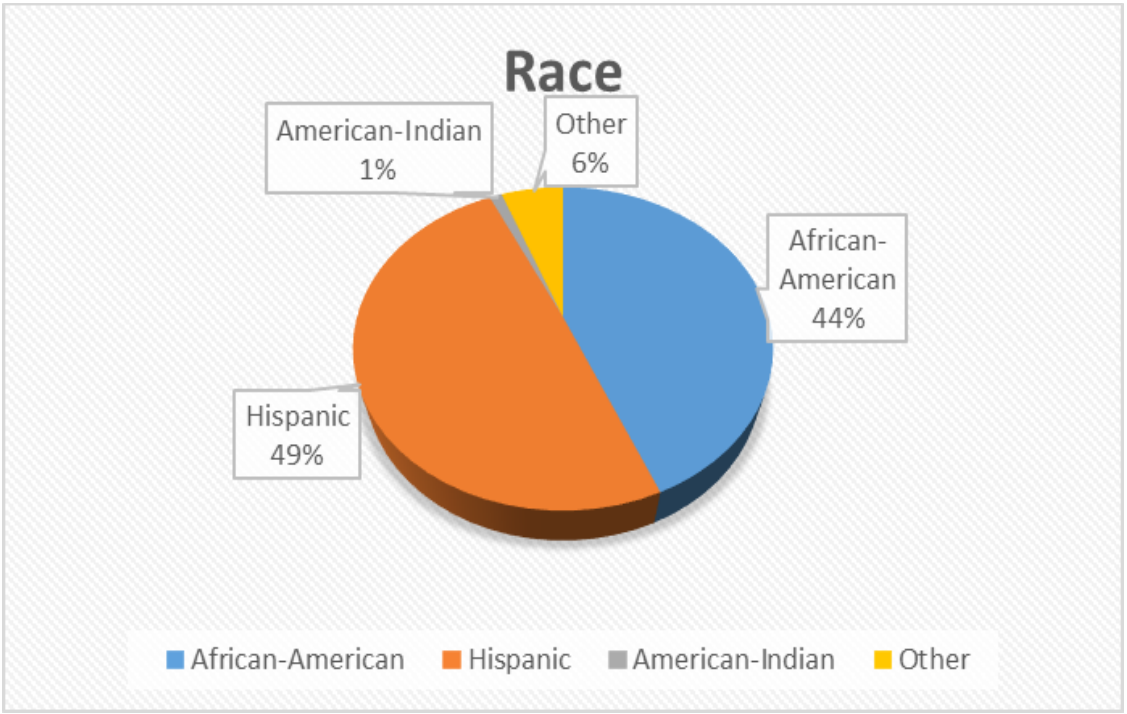

Figure 2 A graph representation of the ethnic background and race of student participants.

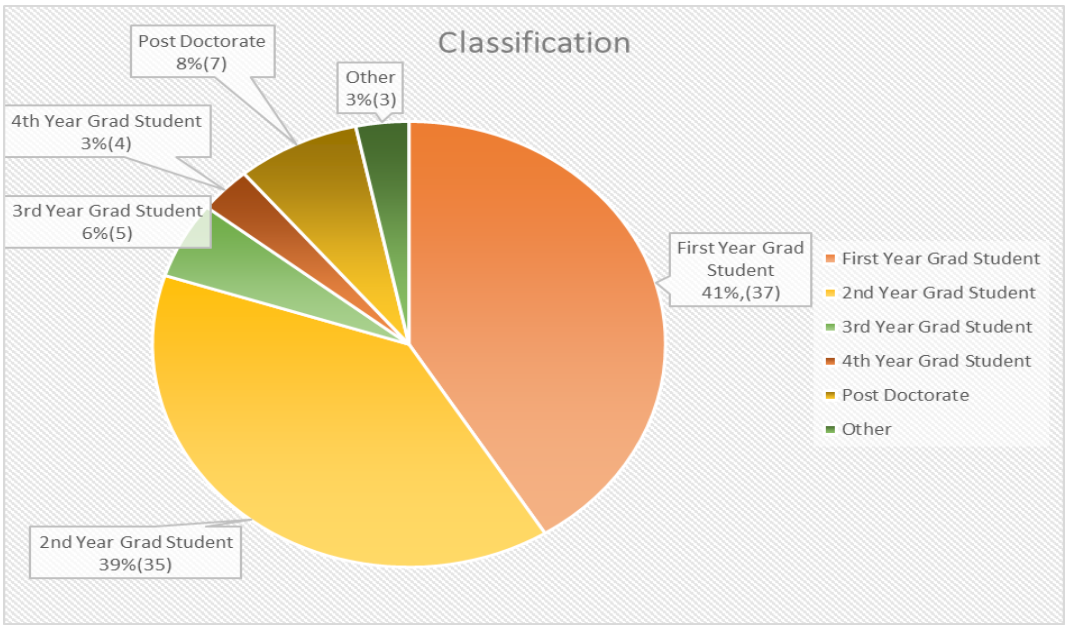

Figure 3 A graph representation of the classification status of student participants.

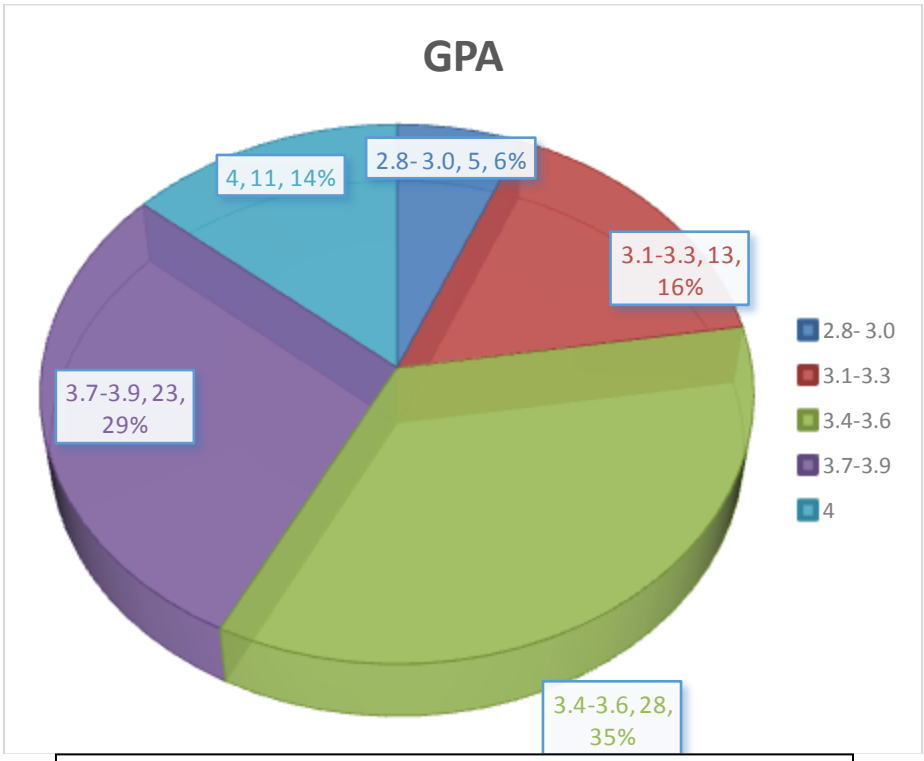

Figure 4 A graph representation of the GPAs of student participants.

Materials and Procedure

A 21-item survey consisting of multiple choice and short answer questions specifically for STEM unrepresented minority graduate students was developed, distributed, and collected from

graduate students in various STEM graduate programs. The survey instrument consisted of demographic-based questions. Additionally, the survey instrument included open-ended program-based questions. Below is a list of a few examples of questions that students were asked using the survey instrument:

1. List any research activities that you are (or were) involved in (e.g., symposium, publications, presentations, etc.) during your graduate program.
2. Which factors seem (or have seemed) to be hindrances to you while in graduate school?
3. Which factors help (or helped) keep you motivated while in graduate school?
4. Which factors do you feel keep (or have kept) other graduate students from completing their degrees?
5. How would you rate the quality of your program as it relates to its ability to successfully train and graduate women or underrepresented graduate STEM students?

The survey instrument assisted in gathering data regarding program, departmental, and institutional practices, procedures, and policies.

Results

Results indicate motivation as a primary factor for graduate student success in STEM programs. For example, a student's focus on long term goals directly motivated the student in the STEM graduate program. Student individual comments regarding sources of motivation include some of the following: "eyes on the prize attitude, and the thrill of research" and "focusing on the long term goal of pursuing this degree." The students reported being motivated from advisors, family, and friends as well as long- term success.

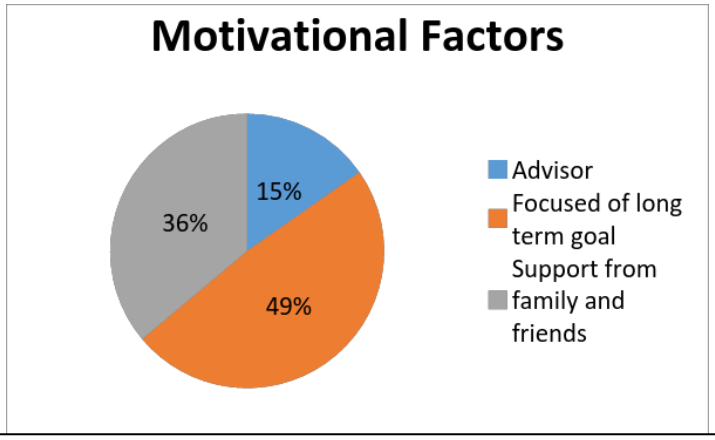

Figure 5 Motivational factors identified by graduate students in STEM programs.

Approximately, 49% of graduate students surveyed reported that a focus on their long term goals kept them motivated while in graduate school. Factors that motivated students while in graduate school were support systems of family and friends (18%) and self-determination (18%). Student reports regarding sources of motivation in this section include some of the following: "family, friends, and myself; family, friends, goals, and God; my family mainly my father who has been my biggest supporter from day one; peers; my family's support, seeing other fellows of high caliber succeed."

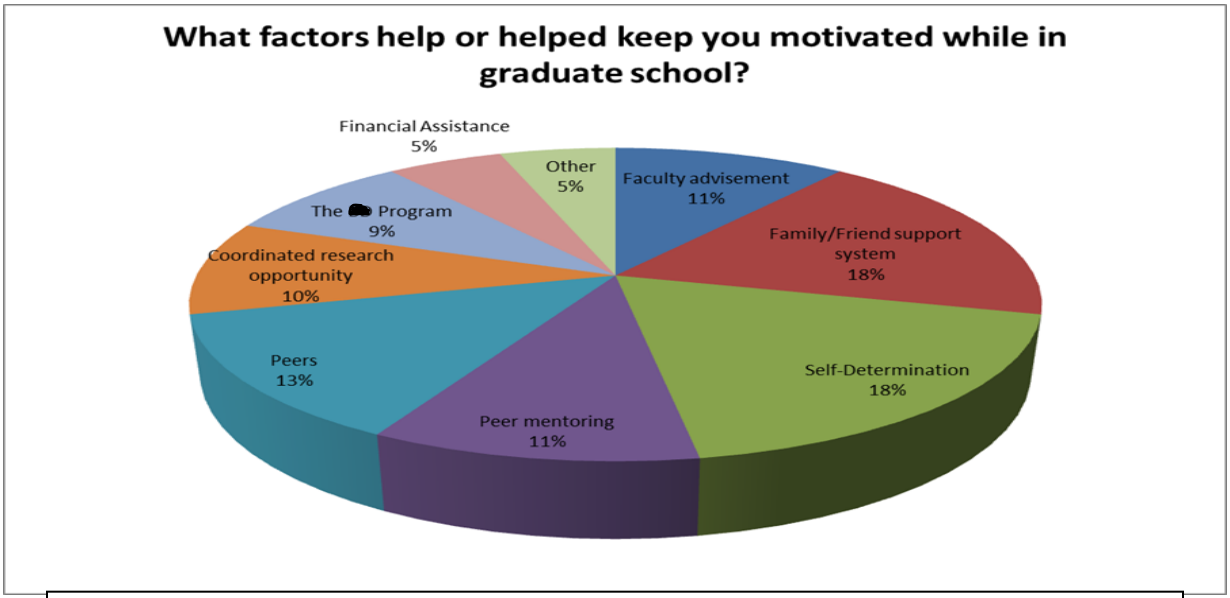

Figure 6 Identified factors that helped keep graduate students motivated in STEM graduate programs.

Figure 6 displays the factors that the participants reported that helped keep them motivated while in school. The largest percent of students reported that they were motivated by self-determination and a family and friend support system. These results are key factors that kept graduate students motivated to be successful in graduate school.

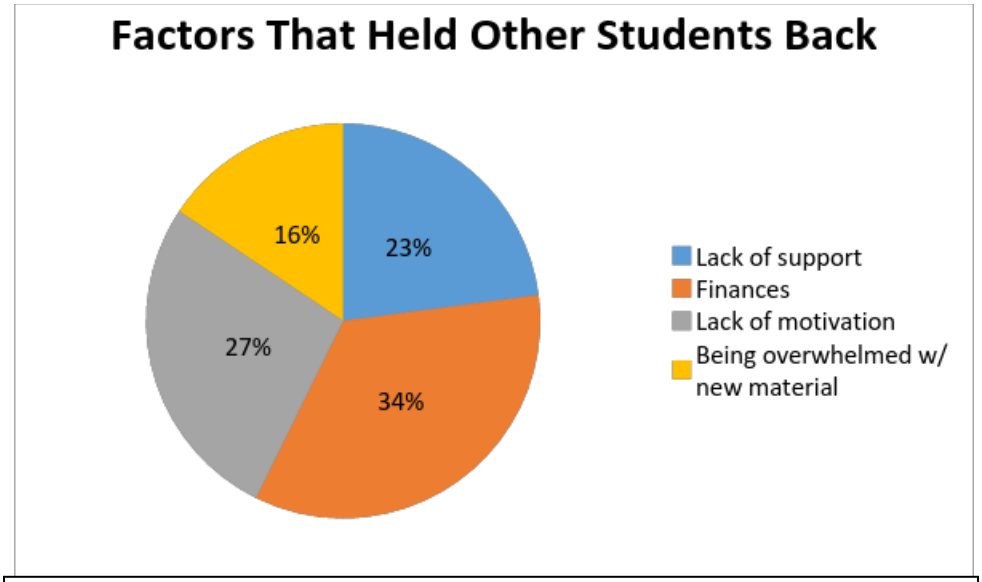

Figure 7 Identified factors that students reported held other students back.

Participant responses describing factors that held them back while pursuing their degree are shown in figure seven. Sixteen percent reported that being overwhelmed with new material held other students back in their program, 27% reported that students were held back due to a lack of motivation, making motivation a key component of students' perceived ability to succeed. Student reports regarding factors that held other students back include some of the following:

“poor time management and lack of motivation; not being able to see the end goals; falling behind in courses, when the material is extremely difficult; motivation, lack of funding; difficulty in program, and lack of assistance with studies (tutors); feeling overwhelmed with the work/moving to a new place, not seeing the benefits of being in grad school- so many yrs of school and not enough opportunities for jobs.”

In analyzing the factors that contributed to the success of women and underrepresented minority STEM graduate students, over 80% of students reported that faculty or student mentoring is a beneficial source of support for this population in their respective STEM graduate programs. About 67% of students surveyed reported financial concerns while pursuing a STEM graduate degree. While 89% reported that they had “adequate” financial support from their institutions, 34% reported that financial concern is the factor that has held other students back. At least 25% reported that they took a break during their program in order to work to earn money. Thirteen percent shared that their break was due to an uncertainty in continuing in their respective STEM field.

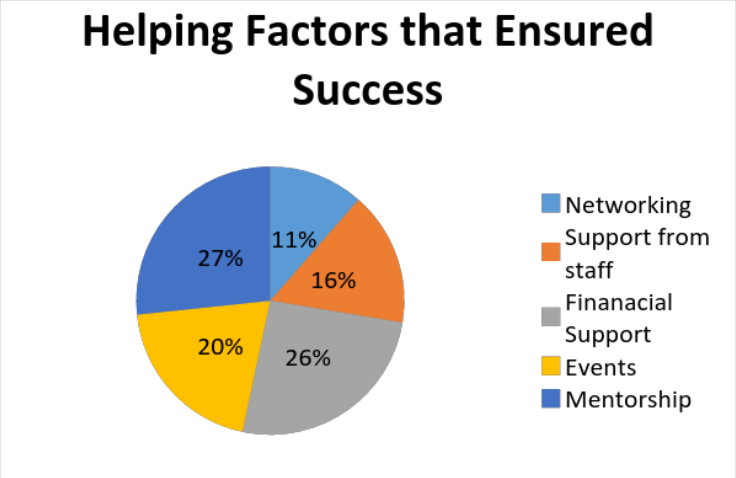

Figure 8 Financial support and networking as the top 2 “helping factors” in ensuring graduate student success in STEM programs.

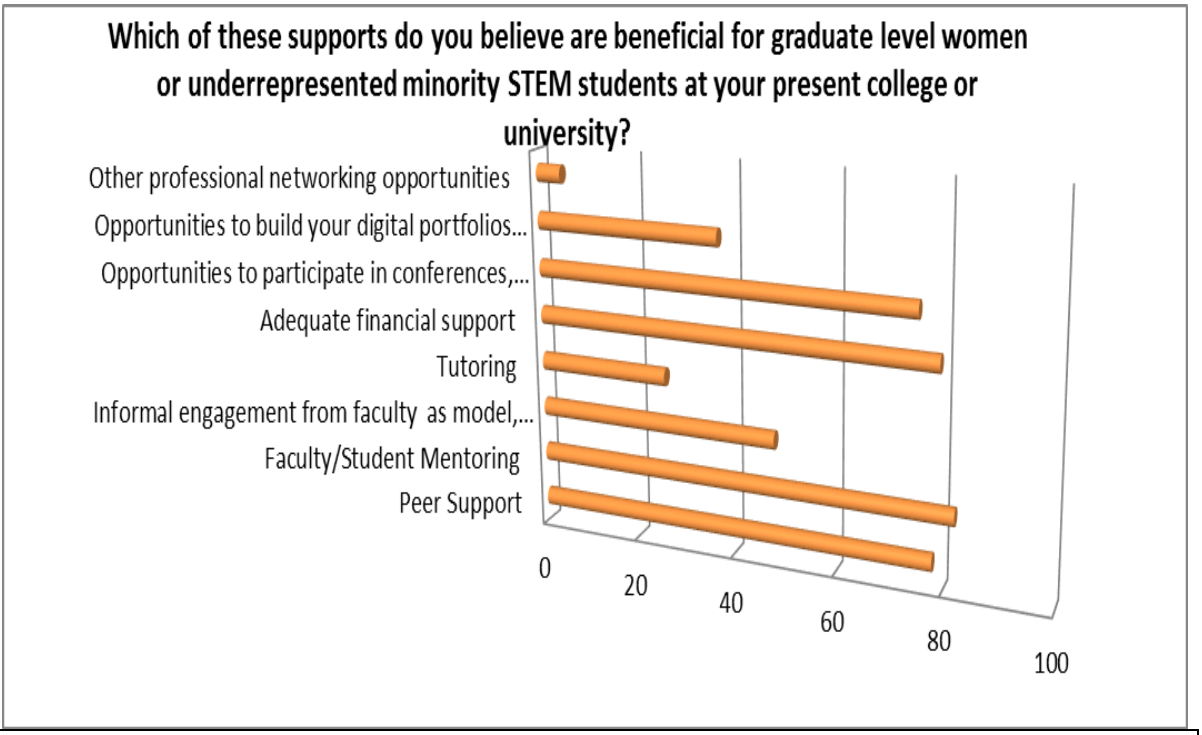

Figure 9 Identified beneficial supports for graduate level women or underrepresented minority STEM graduate students.

Additional findings include 80% of surveyors' reports that the most beneficial factor at their current institution is faculty or student mentoring for graduate level women or underrepresented minority STEM students. Student reports regarding beneficial supports for women and underrepresented minority students include some of the following: "Peer support, faculty/student mentoring, adequate financial support, and opportunities to participate in conferences, networking, research, and research presentations at conferences; peer support, and faculty/ student mentoring; Peer support, faculty/ student mentoring, adequate financial support, opportunities to participate in conferences, networking, research, and research presentations at conferences, opportunities to build your digital portfolios prior to graduating with a STEM degree."

Eighty-five percent of surveyors reported having a mentor in their respective programs. Similarly in regards to mentoring, student reports reveal that the top two factors that support success in the STEM graduate programs are mentorship and financial support. Approximately 90% of surveyors feel "confident" or "very confident" in their skill readiness to pursue preferred STEM careers with majority of students surveyed earning above 3.0 GPAs (Grade Point Average). Other findings include that of student satisfaction, where 94% of surveyors rated the quality of their respective STEM graduate program as either "excellent, very good," or "good."

Discussion

Trend analyses of results indicate financial support as well as mentoring as two noteworthy findings that are prioritized factors for underrepresented STEM graduate students. Also, the

reported relationship among long-term goal focus of students, support system of students and self-determination of students in increasing student motivation in STEM graduate programs is pertinent to student success. Focusing on a long-term goal can help a student in adverse settings, increase student discipline, and contribute to encouraging underrepresented minority students breaking barriers in STEM programs. Mentoring is incredibly important for underrepresented minority students and women in STEM as these students are less represented in STEM programs and professions. Accordingly, a mentor's leadership will guide the student's novel experiences and help facilitate the process of the student adapting to the program structure and setting. In this research study underrepresented minority students have identified various sources of motivation, financial assistance, and mentoring as supportive practices to help them graduate from STEM graduate programs.

Conclusion

Research efforts in identity development analysis, student persistence, and specific program influences have built the foundation of literature in understanding and improving the disproportional representation of underrepresented minority students in STEM graduate programs.[1,3,5] The literature in STEM research and the growth of specific programs aimed at supporting the success of underrepresented minority graduate students in STEM convey the need to analyze STEM graduate programs to warrant a supportive practice model for this vulnerable student population. [2,4,9] The findings and efforts of this study will raise awareness of student needs and disparities in current practices in STEM graduate programs from a student perspective, such as the roles of motivation, financial aid, mentoring, and support systems on student experiences and performance in STEM graduate programs. The supportive practice model developed from graduate student perspectives will allow valuable information to be shared among graduate program faculty, staff, students, administrators, and other key persons to support and to ensure graduate student success.

Implications for Future Research

Motivational practices and methods used in STEM graduate programs will benefit student completion rates of programs. Understanding the effects of support systems, such as friends and family have on student motivation will help leaders increase such sources of motivation to lead to improved graduate student performance. Evaluating students' definition and perception of self-determination will further support increased means of motivation for students. Mentors play a large role in the professional and educational development of students in STEM graduate programs. Therefore, this aspect of STEM graduate programs should be further assessed to learn how leaders of the programs can best support graduate students. Deeper analysis of mentoring and financial support in STEM graduate programs is necessary in order to develop a supportive practice model for institutional, departmental, and program policies and procedures to align with underrepresented graduate student needs. Identifying and defining student demands as well as leader roles in STEM graduate programs will be fundamental to understanding the specific factors that foster the academic and professional development of underrepresented graduate STEM students.

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