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Preparing for Engineering and Other STEM Graduate/Post-Graduate Masters and Doctoral Programs

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ABSTRACT

PROMISE: Maryland's Alliance for Graduate Education and the Professoriate (AGEP), sponsored by the National Science Foundation and led by the University of Maryland Baltimore County (UMBC), has designed and implemented programs to recruit underrepresented students for graduate programs in engineering and other science, technology, engineering, and mathematics (STEM) fields. The programs to cultivate new graduate students have been administered in Maryland as part of UMBC's Horizons initiative, at national conferences for the Society for Hispanic Professional Engineers (SHPE), and in Puerto Rico through the Ana G. Méndez University System Research Symposia. Additional collaborations for recruitment have been established with Universidad Metropolitana, the University of Puerto Rico Mayagüez, and the Puerto Rico AGEP. The PROMISE AGEP in Maryland has provided students with impactful training for developing competitive graduate school admissions statements of purpose, garnering appropriate letters of recommendation, and targeted study for the Graduate Record Exam. This paper addresses elements of the application, and provides tips for increasing the strength of the admissions package. The information presented in this document can be utilized by faculty, administrators, and prospective graduate students.

Keywords: Graduate School Application, Ph.D. Preparation

1. INTRODUCTION

Preparing for a graduate program is a complex task that requires groundwork and planning. The process of applying has challenges, however, aspiring to continue graduate education can be even more difficult if there are few resources available to support the process toward continuing higher education. These difficulties have been experienced by different minority groups, among them Hispanic students, who are underrepresented in graduate programs across the United States. In a report looking at trends of Hispanic Americans in science and engineering, the Commission on Professionals in Science and Technology (CSPT) noted that the rapid growth of the Hispanic population has not yet been accompanied by a comparable increase in science and engineering degrees. Noting that Hispanics comprise several subgroups, with roots in Mexico, Cuba, Puerto Rico, the Dominican Republic, El Salvador, Nicaragua, Guatemala, and Panama, as well as countries in South America, CSPT found that progress for Hispanic Americans has been limited, particularly at the higher education levels. Despite the limits, there has been some growth. Between 1989 and 1998, the number of Hispanics earning doctorates in science and engineering nearly doubled from 382 to 752. However, despite the higher growth rate, Hispanics only earned 3.3% of the doctorates awarded in science and engineering in 1996. As of 2001, although some initiatives had been developed to increase the number of underrepresented students, there had not been an outstanding change in the numbers of admitted minorities in graduate programs (Babco, 2000; Babco, 2001).

More recent data shows that there has been slight improvement. Data from the 2010 Survey of Earned Doctorates (SED) showed that out of 3,303 doctorate degrees granted by institutions in the United States to graduate students in the field of Engineering, there were small numbers of PhD graduates from Hispanic or Latino origin. Only 191 doctorate degrees were granted to Hispanics that year (NSF, 2011a), however, this number represents 5.8% of the earned doctorates in science and engineering, an improvement from 3.3% in 1996. Despite the incremental improvement, the numbers of Hispanic Americans receiving degrees in science and engineering remains low when they are compared to their Caucasian and Asian counterparts. In order to have more graduates, enrollments must increase. Data from the National Science Foundation shows that in 2009, 497,223 students were enrolled in doctorate science and engineering programs across the United States. However, only 23,131 (4.7%) of these students were of Hispanic or Latino origin. (NSF 2011b).

Since preparation is a critical key for survival in STEM graduate programs, the National Science Foundation (NSF) established the Alliances for Graduate Education and the Professoriate (AGEP) "to create and implement innovative models for recruiting, mentoring, and retaining minority students in doctoral programs." These alliances have been offering support to minorities interested in joining graduate programs (Chubin et al., 2005). With the support of AGEPs, undergraduate students from underrepresented backgrounds, including those from U.S. territories outside of the mainland are being prepared for success in graduate school. PROMISE, the AGEP for the State of Maryland, has been working collaboratively with other NSF sponsored programs throughout the U.S. and the Caribbean to increase the numbers of underrepresented students in STEM graduate programs by providing information and extensive training for the graduate school admissions process.

2. ELEMENTS OF THE APPLICATION FOR GRADUATE PROGRAMS IN ENGINEERING

The following sections briefly describe parts of the graduate school application package and contain information compiled from four AGEP campuses with competitive engineering programs: UMBC, Purdue University, the University of Michigan, and Georgia Institute of Technology. Admissions criteria for graduate programs vary between universities, however there are similarities that student applicants can abide by as they prepare their applications. All aspects of the application are important and prospective graduate students should note that applications are evaluated as a complete package. Most graduate engineering programs in the U.S. are highly competitive; therefore, information regarding preparing contents of the package can be an important tool.

2.1 APPLICATION, TRANSCRIPTS, AND RESUME

Online applications can be found on the websites for the engineering department to which one is applying, or a website for the graduate school. The general application page asks for basic contact information, demographics, and educational background. Many applications are due in January, but some departments have earlier deadlines for Fall admission. Students should read through the information on the engineering department's website because there may be extra instructions to be aware of, such as a "Pre-Application" or an additional essay.

Prospective students should submit official transcripts from every institution of higher learning that they have attended. Although there are variations within departments, most graduate programs in Engineering require a grade point average of 3.0 or higher to be considered for admission. For some departments, a GPA of 3.5 or more is required, especially for doctoral degrees. Applicants should also pay attention to the number of copies that must be submitted, since in some cases, programs require more than one copy when reviewing applications. A resume is an option that some departments use to learn more about the experience and background of each student. Relevant courses taken, internships, awards, publications, and presentations should be emphasized in the resume in order to increase the chances of admission. Part of the preparation for graduate school is the right selection of courses, internships, and projects that would help to have a strong resume when applying (Georgia Tech, 2010, Purdue 2012, UMBC 2012).

2.2 THE GRADUATE RECORD EXAM (GRE) AND TOEFL

The GRE is required by many, though not all, engineering departments. GRE Scores are often a contributing factor of the overall application for students interested in engineering graduate programs because of the Quantitative Reasoning section that scores mathematics ability. The other sections of the test include measures for Verbal Reasoning and Analytical Writing. The GRE General Test was revised in August 2011 and the new scores range between 130 and 170, in 1-point increments for both the Verbal Reasoning and Quantitative Reasoning sections. The Analytical Writing section is still scored on a scale that ranges between 0 and 6. (ETS, 2012a) Although research has suggested that more data should be collected about admissions criteria and processes, ~~"in~~cluding the predictive value of admissions tests," the websites for universities are good sources of information for scores and ranges required for admission (George et al., 2001). In the revised version of the GRE, students are usually expected to score above 150 in both quantitative and verbal areas. For example, students interested in applying to Purdue University are required to have scores of 156 or higher for the Verbal Reasoning measure and 159 or higher for the Quantitative Reasoning measure (Purdue, 2012). Since many graduate programs in Engineering are highly competitive, the GRE scores can be a decisive part of the application. Further, low GRE scores can drastically reduce or eliminate the chance for admission (Georgia Tech, 2010). For this reason, students are strongly encouraged to prepare themselves and retake the test if necessary.

Graduate programs in engineering have additional requirements for international students. International students without a degree from a U.S. college or university are required to complete the Test of English as a Foreign Language (TOEFL) exam to show proficiency in English language. Some universities such as the University of Michigan have their own language proficiency exams that applicants can use to demonstrate their knowledge of the language. Further, international students should submit certified and translated copies of their transcripts to show equivalency to the U.S. higher education systems (Michigan Engineering, 2012).

2.3 Statement of purpose and Letters of Recommendation

The statement of purpose is generally a requirement for graduate engineering programs in the U.S. The required length of this statement is approximately 300-500 words, and it should be goal-oriented and specific (UMBC, 2012). Prospective graduate students should explain in detail the skills and achievements that they would be bringing to their departments, their research interest, and how the program fits their interests and experience. On average, graduate programs in engineering require three letters of recommendations from individuals who can attest to the prospective student's preparation and potential for success in graduate school. Graduate programs prefer letters of recommendation to be prepared by faculty members who have previously worked with the student and can evaluate the research, analytical, and academic skills of the prospective student. These faculty members must be familiar with the research of the student (Michigan Engineering, 2012). Some universities may require that all of the letters come from faculty members, while others ask for at least two of the three letters to be written by professors (Georgia Tech, 2010).

3. Training Outreach efforts to Caribbean and Latin American students

The Graduate School at UMBC has been strengthening its outreach efforts to students from Caribbean and Latin American countries over the past 10 years. As the lead institution for PROMISE: Maryland's AGEP, UMBC has had a leading role in programs that particularly serve students from the Caribbean. As a commonwealth and territory of the United States respectively, students from Puerto Rico and the Virgin Islands are eligible for the support services and graduate school preparation training that PROMISE provides to students through funding from the NSF.

3.1 Collaborative Training in Puerto Rico and at conferences that reach Hispanic Students

UMBC through PROMISE has regularly contributed to graduate school preparation training that students in Puerto Rico have received through the former NSF Model Institutions of Excellence (MIE) program led by Universidad Metropolitana. The Model Institutions for Excellence Project in Puerto Rico (Proyecto MIE) focused activities for students in STEM disciplines. The annual Symposia agenda for undergraduate students includes oral and poster sessions where students are judged on the content of their research and their ability to deliver a

strong presentation in English, exhibits that showcase summer research opportunities, and panels that prepare students for the graduate school admissions process. For the past several years, UMBC has led the "Graduate School" panel for this program in Puerto Rico. The panel includes university representatives and industry professionals from organizations such as NASA, the National Institutes of Health, and the National Institute of Standards and Technology (NIST) who discuss summer research opportunities and provide tips for success in graduate school. The MIE program has grown, and has since transitioned into the *Student Research Development Center at AGMUS - Ana G. Méndez University System/Sistema Universitario Ana G. Méndez* (AGMUS, 2011). The program annually serves hundreds of students within the AGMUS and the University of Puerto Rico systems, reaching the population of undergraduate students in STEM across Puerto Rico. UMBC through PROMISE has also collaborated with the Institute for Broadening Participation (IBP) to provide graduate school funding information to students at conferences in Puerto Rico and at annual conferences of the Society for the Advancement of Chicano and Native American Scientists (SACNAS). In addition, UMBC has had a collaborative relationship with the Society of Hispanic Professional Engineers (SHPE) through the SHPE Foundation's *Advancing Hispanic Excellence in Technology, Engineering, Math, and Science* (AHETEMS) initiative, and through SHPE's Graduate Institute. UMBC has also participated in judging and mentoring students during national research competitions for SHPE, SACNAS, and AGMUS. Table 1 describes some of the keynote addresses and workshops that PROMISE has given (by invitation) that particularly serve Hispanic students. Panel discussions, statement of purpose "coaching sessions", resume reviews, and other training activities that were held on campuses in Puerto Rico and at other conferences are not included in the table.

Table 1: UMBC's PROMISE Lectures and seminars at locations outside of Maryland that have served students from Latin America and the Caribbean

Title	Type	Month, year	Location	Sponsor(s)
Luchen por Sus Sueños	Keynote	September, 2011	AGMUS Symposium, San Juan	PROMISE AGEP, UMET
Taller Para Escuela Graduada	Workshop	January, 2009	UMET's Campus	UMET (Office of the Chancellor)
Preparation for Success	Workshop	September, 2008	Research Symposium, San Juan	UMET, PROMISE
Confidently Developing Competitive Graduate School Applications	Workshop	January, 2006	SHPE Conference, Orlando, FL	PROMISE
A Path to Leadership	Keynote	September, 2006	Research Symposium	UMET (Proyecto MIE), PROMISE
How to Prepare a Competitive Graduate School Application	Workshop	January, 2005	SHPE Conference, Dallas, TX	PROMISE
Mitos de Escuela Graduada	Workshop	September, 2004	University of Puerto Rico Mayagüez	PROMISE
Visualize Your Future with a Ph.D.	Keynote	December, 2004	Research Symposium, San Juan	UMET (Proyecto MIE), PROMISE

3.2. THE HORIZONS GRADUATE SCHOOL PREPARATION PROGRAM IN MARYLAND

The Horizons program is one of the initiatives that UMBC developed through PROMISE to recruit and cultivate prospective graduate students. Students from across the mainland U.S., Puerto Rico, and the U.S. Virgin Islands are invited to UMBC's campus for a program that explains the graduate school application process. During this event, prospective graduate students are introduced to different graduate programs and the specific guidelines for admission within each department. In addition, students are provided ~~"h~~ow to" guidelines for letters of recommendation, statements of purposes, and preparation for the GRE Exam. Students also have the chance to network with faculty members from the departments of their interest.

UMBC has served students from a number of schools throughout Latin America and the Caribbean. Many of the students came to Horizons as a result of participating in a summer program in Maryland, Virginia, or the District of Columbia. Others came as a result of invitations that were sent to faculty or administrators at their respective universities. Table 2 represents the institutions of students who have participated in UMBC's training workshops in Puerto Rico or as part of the Horizons program in Maryland. The following LACCEI member universities have also had student participants: Florida International University, Pennsylvania State University, Rice University, University of Florida, and the University of Houston. Since 2002, more than 1000 students have come to UMBC's campus to participate in the Horizons program for graduate school preparation.

Table 2: Latin American and Caribbean Institutions With Students served By UMBC's Training Workshops in Maryland and Puerto Rico

Inter-American University, Metro	Universidad Adventista de las Atillas
Inter-American University, San Germán	Pontifical Catholic University, Puerto Rico
Polytechnic University of Puerto Rico	Universidad de los Andes, Bogota, Colombia
Universidad del Este	University of the Virgin Islands
Universidad del Turabo	University of Puerto Rico – Mayagüez
Universidad Metropolitana	University of Puerto Rico – Río Piedras

4. INNOVATIONS IN PROGRAM CONTENT DESIGNED TO INCREASE ACCESS

UMBC's PROMISE seminars and workshops for graduate school preparation focus on four key areas: *Transcript, Letters of Recommendation, Statement of Purpose, and GRE Score.* Students are cautioned to remember that they should be striving for top grades in all of their courses. Programs in engineering and other STEM areas expect to see top grades in all mathematics and science courses. Some students have made the mistake of obtaining mediocre grades in the core sciences, engineering, and math courses, while achieving stellar marks in electives. In these cases, the grade point averages seem acceptable, but students are not accepted into graduate programs because the top grades were in areas that weren't related to knowledge needed for engineering. The seminars discuss these types of pitfalls and errors, and go beyond providing basic tips, by including brainstorming sessions, writing exercises, and detailed steps for completing each part of the graduate school application.

4.1 LETTERS OF RECOMMENDATION: 10 ITEM CHECKLIST

Students who attend UMBC's seminars are cautioned to seek very strong letters of recommendation from faculty members, a concept that has long been part of the foundation of advice that is given to students by the National GEM Consortium. UMBC's facilitator teaches students to provide their faculty recommenders with the following items

1. Copy of resume or CV
2. Research Statement
3. GRE Scores
4. List of universities to which you're applying
5. Bullet point list of your own highlights (differentiators, innovations, superlatives)

6. Electronic list of links for departments to which you're applying
7. Transcript and GPA
8. Due Dates
9. Addresses, list of websites where letters should be sent
10. Links to your websites

Students are taught to present all of the above information to their recommenders via email and in hard copy format in a folder. They are also trained to consider the recommender's point of view. For example, students should consider that a recommender might think about the following questions while writing the letter:

- *How do I know you? Am I willing to put my reputation on the line for you?*
- *Am I able to speak to specific examples where I've experienced your expertise?*
- *If you've worked for me, did you do a good job? Have you taken my advice?*

These guidelines are presented to students during the workshops and seminars to provide them with concrete ways to complete their packages.

4.2 STATEMENT OF PURPOSE: FOUR PARAGRAPH TEMPLATE

During UMBC's PROMISE seminars and Horizons workshops, students are taught to thoroughly read through the engineering departments' websites and write their statements of purpose based on their personal research interests and experiences, coupled with research that is being conducted in the department. Members of faculty-led admissions committees from several universities have commented to our facilitators that they have seen many statements of purpose didn't have a connection to research that was being done in the department. Students are told to be sure that the recipients of their graduate school package know explicitly why they want to be at that university, in that department, in that particular lab or group, and what they want to do. When students are applying to Graduate School, and to doctoral programs in particular, they must be sure to make the case for the reasons why they want to be there. The statement of purpose should reflect the "why". *Why you? Why that particular research? Why do you want to work with those professors or that lab?* To assist students with writing their statements of purpose, our facilitators recommend the following four-paragraph structure:

- ***Paragraph 1:*** Identify interest in the field and mention what you want to study. Be able to answer the following questions: What is your interest in the field? What shaped your early interest? What kind of research do you want to do? What do you want to study? What problem do you want to solve?
- ***Paragraph 2:*** Discuss past research experiences, skills gained related to relevant processes and methods, and proficient use of equipment; include academic awards, presentations, and results. Discuss the ways that these experiences contribute to readiness for graduate study in the laboratory of interest.
- ***Paragraph 3***: Write about interest in the university, the department, and the laboratory. Discuss the research that the lab of interest is conducting and your connection, experience, or interest in that topic. Pay attention to work that is being done by a particular center on campus, the department or particular professors.
- ***Paragraph 4:*** Briefly discuss your planned contribution to the field, including short-term goals (within 5 years of the degree) and long-term goals (at least 10 years following completion the doctorate.)

UMBC's workshop facilitators recommend that students allow at least two members of the faculty or staff to read their Statements of Purpose before submitting the application.

4.3 GRE SCORE: FOCUSED ATTENTION ON MATHEMATICS

Engineering programs expect students to have aptitude for mathematics. The GRE provides faculty admissions committees with a standard measure by which to evaluate prospective students. During UMBC's workshops and seminars, students are reminded that many of the topics in the "Quantitative Reasoning" portion of the GRE

include concepts from high school or secondary school. Other topics are taught in introductory statistics courses and some students aren't exposed to probability and statistics until they reach the university. However, students in the seminars regularly reveal that they didn't know that they had to study for the GRE. While inferential statistics and the ability to construct proofs are not tested on the GRE, several students in seminars have been hesitant when they were asked for immediate answers to sample questions involving factorials, inequalities, or geometric representations. The students said that they "used to know" how to solve certain kinds of equations or that they "didn't remember" concepts. To prepare students for the exam, UMBC's seminars provide students with a live sample problem solving session, and the list of skills that they need in order to do well on the quantitative measure. Table 3 lists the skills that students need to remember, understand, master, and learn for the GRE per the Educational Testing Service (ETS). Students in the seminar are also referred to the 99 page "Math Review" downloadable document that ETS provides on their website at no cost. The "Math Review" contains information about the types of problems that students will see on the exam. It includes explanations of concepts, sample problems, along with answers to the respective problems (ETS, 2012b).

Table 3: Math Skills Needed for the Revised GRE (ETS, 2012b)

Arithmetic
Concepts to remember: Properties and types of integers, such as divisibility, factorization, prime numbers, remainders and odd and even integers, arithmetic operations, exponents and radicals; concepts such as estimation, percent, ratio, rate, absolute value, the number line, decimal representation and sequences of numbers.
Algebra
Concepts to master: Operations with exponents, factoring and simplifying algebraic expressions, relations, functions, equations and inequalities, solving linear and quadratic equations and inequalities, solving simultaneous equations and inequalities, setting up equations to solve word problems, coordinate geometry, including slopes and intercepts of lines and graphs of functions, equations and inequalities.
Geometry
Concepts to study: Parallel and perpendicular lines, circles, triangles — including isosceles, equilateral and 30°-60°-90° triangles — quadrilaterals, other polygons, congruent and similar figures, three-dimensional figures, area, perimeter, volume, the Pythagorean theorem, angle measurement in degrees.
Data analysis
Concepts to learn: basic descriptive statistics, e.g., mean, median, mode, range, standard deviation, interquartile range, quartiles and percentiles, interpretation of data in tables and graphs, e.g., line graphs, bar graphs, circle graphs, boxplots, scatterplots and frequency distributions, elementary probability, e.g., probabilities of compound events and independent events; random variables and probability distributions, including normal distributions; and counting methods, e.g, combinations, permutations and Venn diagrams

5. INTEGRATING SOCIAL AND PROFESSIONAL DEVELOPMENT TO RETAIN CARIBBEAN AND LATIN AMERICAN GRADUATE STUDENTS

Once students are recruited to graduate school, it is important to have initiatives that will keep them enrolled and engaged. In addition to research and activities within the respective departments, the graduate students at UMBC are exposed to seminars and workshops throughout the year that assist with their professional development.

Annual seminars include Institutional Review Board (IRB)/Responsible Conduct of Research, Graduate Level Writing, and Leadership. The "PROF-it: Professors in Training" program has seminars such as "Developing the Teaching Portfolio," and "Learning Styles", and partners with the Office of Teaching and Learning for workshops on hybrid learning, and teaching with technology. At advanced stages, students participate in the Dissertation House to help them to complete the final document and prepare for the doctoral defense. The Dissertation House blog includes encouragement and short discourse by students and administrators in both English and Spanish. Through PROMISE: Maryland's AGEP, UMBC has facilitated retention for underrepresented graduate students in STEM by initiating connections amongst Caribbean and Latin American students, across departments, regardless of discipline. As an example, the PROMISE Opening meetings, held twice a year at the beginning of the Fall and Spring semesters, provide students with opportunities to introduce themselves to the international graduate community of students of Hispanic and African descent. These meetings have created particularly strong relationships amongst graduate students from Caribbean and Latin American countries, and now include faculty from these regions. Finding this support from other graduate students with similar backgrounds has helped students to have a more enjoyable and socially active experience at UMBC. These opening meetings have presented opportunities for Latin American and Caribbean graduate students to connect through different topics that are non-academic. Students share the talents and hobbies that they have in common, as well as the types of food and music that they enjoy. These meetings have helped to unite graduate students with similar ethnic backgrounds. Students from Mexico, Colombia, Panama, Peru, Puerto Rico, Bolivia, Chile, Argentina, Venezuela, Trinidad & Tobago, and those with families and origins from those and other Latin American and Caribbean countries have connected during these meetings and have developed friendships and other social ties. As a result, students have connected to develop study groups, join "salsa" dancing groups, and attend other events on campus as a group.

PROMISE has developed additional initiatives to connect students from Latin American and Caribbean backgrounds. In 2011, PROMISE implemented "Professors Beyond Borders" seminars to encourage graduate students to consider STEM projects and academic careers in different countries. Guest speakers have included graduate students and faculty members from countries such as Costa Rica, Spain and Peru. PROMISE also sponsors the Summer Success Institute (SSI) in Maryland which features professors from universities throughout the states and Puerto Rico. Spanish has become an alternative language for the organization in an effort to create a more welcoming and inclusive atmosphere for graduate students. Staff members of PROMISE currently use Spanish in written communications, speeches, presentations, and informal conversations with students. PROMISE has remained aware of the importance of increasing the number of students from Latin America and the Caribbean origins in order to retain others with similar backgrounds. The current Graduate Assistants (GAs) for PROMISE are from Trinidad & Tobago and from Panama, and the former GAs were from the Dominican Republic and Argentina. Each has assisted PROMISE with focused outreach to prospective and current graduate students with Caribbean and Latin American origins.

6. CONCLUSIONS AND FINAL RECOMMENDATIONS FOR PREPARING STUDENTS FOR GRADUATE STUDY

There are several things that faculty and program directors can do to prepare their students for advanced study in engineering. Here are some recommendations:

- Be sure that students are familiar with the curriculum, and that they have solid foundations in advanced mathematics and in core areas of the discipline. Prepare them for the Graduate Record Exam, particularly the quantitative (math) section. Engineering applicants are expected to have high scores in this area.
- Provide students with opportunities for research experience that will apply their skills. The research experiences or internships can be in a laboratory on the campus or in the region, or the student can apply for an opportunity to participate in a research program or internship anywhere in the world.
- Equip students with training for the graduate school application process. Programs like the GEM GRAD Lab, SHPE, and SACNAS, have comprehensive training programs at annual conferences. The GEM

GRAD Lab also travels and brings their conference to campuses. As an example, the University of Puerto Rico Mayagüez sponsored a GEM GRAD Lab at a local hotel for students on the island 2010.

- Be sure that students have strong recommendation letters from professors who can discuss the student's aptitude for engineering, potential for research, and (if applicable) experience with research. Too often, recommendation "letters" constitute a few sentences or a very short paragraph that do not describe the student's abilities. These short letters do an injustice to the student. A strong recommendation letter discusses the faculty member's confidence in the student and describes in detail the student's experience. The letter can discuss the student's performance in courses, performance in the laboratory, the student's level of initiative and independence, the student's attention to detail and responsibility, and the student's interest in the work. The student's contributions to any presentations or publications that resulted from work in the lab can also be part of the content in the letter.
- Steer students toward a university, department, and faculty that will provide them with mentoring and support once they are admitted to the program.

The PROMISE program has taken a "full circle" approach to addressing graduate level underrepresentation in engineering and other STEM fields by developing programs in four areas: *Recruitment, Retention, Ph.D. Completion, and Transition to Career*. The numbers of underrepresented students in graduate programs is low, therefore, PROMISE has taken steps to increase those numbers by working to increase the numbers of students who are admitted to STEM departments. PROMISE seeks to increase the numbers of admits by increasing students' levels of preparation. The PROMISE program increases students' preparation by collaboratively developing relevant training content and presenting it to students in the states and in Puerto Rico. PROMISE continues to provide students with professional development at the graduate level, both through programs in Maryland and through the Graduate Institute at annual SHPE conferences. More recently, PROMISE has been mentoring students as they graduate and transition to STEM postdocs, faculty, and professional positions. Recruitment and training of students in Puerto Rico has led to plans for a new bilingual program that will train graduate students for faculty positions. Approaching its 10th year, the PROMISE program, led by UMBC, has produced alumni who are now faculty members. As members of teaching and research faculties in the U.S., Chile, and Argentina, these professors are also recruiting and training students with Caribbean and Latin American origins for success in engineering and other STEM fields. PROMISE will continue to work with students, faculty, and administrators, to facilitate increases in the numbers of underrepresented STEM graduate students. The program will also continue to work toward increasing the numbers of future professors who will become the next teachers and mentors for new generation of diverse STEM students.

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