

Assessing a Graduate School Science Recruitment Symposium

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RESUMEN

Ciencia Puerto Rico, una organización sin fines de lucro dedicada a promover la ciencia, la investigación y la educación científica entre los latinos, organizó un simposio educativo para proveer a los estudiantes universitarios con especialidad en ciencia las herramientas, oportunidades y consejos para proseguir estudios graduados y ser exitosos en las disciplinas STEM (acrónimo en inglés para designar ciencia, tecnología, ingeniería y matemáticas). En este artículo, compartimos nuestras experiencias y lecciones aprendidas para que otras entidades interesadas en organizar eventos de gran envergadura consideren reclutar minorías subrepresentadas en STEM y para la evaluación de la efectividad de estos esfuerzos.

Palabras clave: latinos, ciencia, científico, estrategias de reclutamiento, estrategias de retención, escuela graduada, educación STEM

ABSTRACT

Ciencia Puerto Rico, a non-profit organization dedicated to promoting science, research and scientific education among Latinos, organized an educational symposium to provide college science majors the tools, opportunities and advice to pursue graduate degrees and succeed in the STEM disciplines. In this article we share our experiences and lessons learned, for others interested in developing large-scale events to recruit underrepresented minorities to STEM and in evaluating the effectiveness of these efforts.

Keywords: graduate school, Latino, recruitment strategies, retention strategies, science, scientists, STEM education

RECIBIDO: 24 mar. 2014; **ACEPTADO:** 19 may. 2015

■ Introduction

Producing a continuous supply of well-trained, high-quality professionals in science, technology, engineering, and math (STEM) disciplines poses the greatest challenge of U.S. competitiveness over the next decades (Hassoun, 2001). According to recent statistics, the hiring in STEM disciplines has increased 42% since 2008. Some of the highest estimated annual percent increases in employment correspond to STEM disciplines such as biochemistry, biophysics, environmental science/protection (19%), geosciences (16%), and atmospheric science, meteorology, epidemiology,

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hydrology, physics and astronomy (10%) This is equivalent to nearly 100,000 job postings each year (United States Department of Labor, 2015).

Of particular interest are women and minorities, which are underrepresented in STEM but, if properly mentored, could increase the scientific workforce and enhance America's capacity to attend health, economic, and innovation needs (Maddox & Smith-Maddox, 1990; Chubin, May & Babco, 2005; National Research Council, 2011).

Among these underrepresented groups, Latinos are the most rapidly growing segment of the college-aged population, but currently earn far less than a proportional amount of the STEM degrees awarded each year (Saenz & Ponjuan, 2009). In 2009, for example, they represented only 8.5% of bachelors, 5.3% of doctorates, 3.8% of postdocs, and less than 1.5% of the professoriate, despite comprising 16% of the U.S. population (NSF/DSRS, 2011). The huge heterogeneity of cultures, social beliefs, financial challenges and immigration experiences within the Latino population are factors that might explain why it has historically been so difficult to attract them to the sciences (Crisp, Nora & Taggart, 2009; Hernández, Woodcock, Schultz, Estrada & Chance, 2013; Palmer, Maramba, & Elon, 2011). This fact encourages science organizations, particularly those within the Latino community, to strive to develop new and innovative ways to present science careers as realistic and attainable (Carpi, Ronan, Falconer, Boyd, & Lentz, 2013; Peralta, Caspary, & Boothe, 2013).

Ciencia Puerto Rico (CienciaPR) is a not-for-profit organization established in 2006 to promote science, research and scientific education in Puerto Rico. One of the organization's main goals is to help forge future generations of Latino scientists. To reach a large audience of undergraduate science students in Puerto Rico, we decided to offer a day-long educational symposium, which we titled "I want to be a scientist... now what?" The purpose of this article is to provide a rich, thick description of our experience planning and running a large-scale orientation and recruitment science event and to evaluate the effectiveness of this type of symposium. Even though this event happened in Puerto Rico and targeted Latino students, it can be easily replicated in many other states and to reach many other target groups.

This type of study is important for several reasons. First, increasing access to STEM professions among women and minorities is of vital importance to the literature and to our nation. Second, Latino STEM education is an important area for universities to focus on. Furthermore, there is limited information on empirically effective practices to increase the amount of Latino students in STEM.

■ The Symposium

The event was held on 24 September 2011, between 8:30 a.m. and 4:00 p.m. at the University of Puerto Rico Medical Sciences Campus. It had a main goal of orienting students about how to apply and excel in graduate programs, especially those in the biomedical sciences, and describing professional career options after completing a Ph.D. The symposium was offered free of cost and was co-sponsored by Amgen (PR) and the Research Centers in Minority Institutions (RCMI) Program at the University of Puerto Rico Medical Sciences Campus.

As members of the CienciaPR Team are geographically dispersed between the United States and Puerto Rico, the symposium was the result of an efficient “long distance” collaboration that allowed us to organize the event in about six months. Students and faculty from several departments, academic and training programs from different universities in the island were invited through CienciaPR’s mailing list and social media, as well as through notices and invitations sent to professors and coordinators of these departments and programs.

Among the symposium’s objectives were to: (a) demystify scientific careers and the Ph.D. trajectory to better attract and support students interested in biomedical research to doctoral careers; (b) provide information about graduate programs in the biomedical sciences, how to apply, life in graduate school, answer queries and concerns, and clarify misconceptions; (c) identify research training fellowship opportunities for undergraduate and graduate students; (d) discuss career options for biomedical scientists, and (e) identify resources that may help students decide if they want to pursue a Ph.D. and that may help them through their early career stages.

Presenters

The symposium was divided into morning and afternoon large-group sessions, with two one-hour talks each session. The first morning talk, titled “CienciaPR: Science and Community”, was presented by Dr. Daniel Colón-Ramos, assistant professor of Cell Biology at Yale University and founder of CienciaPR. He started by discussing how to make the transition from being a “consumer of knowledge” as an undergraduate, to a “producer of knowledge” as a graduate student. Second, Dr. Colón-Ramos examined the barriers that aspiring scientists from under-represented groups face when training in the sciences, and focused on the importance of finding and choosing mentors. In this section, he emphasized that training in sciences is not a linear trajectory but more of an apprenticeship; that there is no perfect mentor; that graduate students should identify different mentors for varied circumstances at different points in time, and that it is important to be pro-active in the process of selecting and keeping good mentors. Dr. Colón-Ramos concluded his presentation by reflecting on the importance of scientific literacy at all levels. He suggested to the aspiring scientists to keep scientific literacy high on their priority list even if their career trajectories change in the future, as scientific proficiency can benefit other professional endeavors.

The second morning talk was presented by Dr. Mónica I. Feliú-Mójer, at that time a graduate student at Harvard Medical School and vice-director of CienciaPR. The title of her talk was: “I want to be a scientist... now what?” She began by underscoring how her life experiences, her cultural context growing up, and the presence of mentors in her life converged to influence her decision to follow graduate studies. Later, Dr. Feliú-Mójer discussed how to build a good CV in preparation to applying for graduate school. She advised the students to begin exploring their interest in research early during their undergraduate career by applying to summer research internships or looking for research opportunities at their home institutions. For students close to completing their undergraduate degrees interested in acquiring intensive research experience, she suggested to look into post-baccalaureate (post-bac) programs or research job opportunities.

During the second part of her talk Dr. Feliú-Mójer spoke about the purpose of going to graduate school in the biomedical sciences and the skills needed to become independent research scientists, such as thinking critically, learning how to plan, do and interpret experiments, and writing scientific papers. She also mentioned wrong reasons for pursuing a graduate degree, such as people telling you it is the next logical step if you are good at research. Furthermore, for the last part of her talk, Dr. Feliú-Mójer discussed the graduate school application process. She emphasized the importance of having a strong personal statement and letters of recommendation that tell the admissions committee why the student is an outstanding candidate. She also spoke about how to choose a research laboratory and a dissertation advisor that is compatible with the student and his or her needs. She concluded by offering some graduate school “survival tips” like learning effective time management skills, handling criticism, asking for help, and networking.

During lunch, students were assigned at random to a specific table. Members of the CienciaPR team, conference speakers and panelists served as hosts at each of the tables and encouraged networking, candid questions and comments from participants. The students asked questions about the scientists’ research training and trajectory experiences, and had the chance to network with each other and with the table hosts. Discussions spanned from practical questions about how to apply to graduate school to more philosophical ones about the future of science.

The first afternoon talk highlighted research fellowship opportunities. It was presented by Dr. Alberto Rivera-Rentas, at the time a Program Officer for the National Institute of General Medical Sciences (NIGMS), part of the National Institutes of Health (NIH). During the first half of his talk, Dr. Rivera-Rentas talked about the importance of a diverse workforce for the U.S. in STEM careers, and the significant underrepresentation of minorities, including Latinos, in different science fields. He stressed that the primary loss of minorities occurs at the bachelors to Ph.D. transition and enumerated real and perceived reasons why Latinos do not follow advanced degrees in STEM. During the second portion of his talk, Dr. Rivera-Rentas talked about a variety of funding programs offered

by NIH and NIGMS to support student training, diversity inclusion in the biomedical workforce, and the capacity of minority-serving institutions to perform research that can advance understanding of health and disease. He encouraged students in transition to a graduate program to apply to colleges that have an NIH-funded graduate programs (i.e. with T32 grants), as these have been vetted by NIH review committees as having high-quality research training, and to individual predoctoral NIH-sponsored fellowships. He mentioned that success in acquiring individual predoctoral fellowships is a predictor of future success in acquiring postdoctoral funding and achieving faculty positions. Dr. Rivera-Rentas also provided practical advice and writing tips on how to develop a successful fellowship or grant application, and explained the NIH review and award process. Finally, he closed with a personal perspective on various factors he considers important to succeed in science, including careful selection of institutions and mentors, seeking out varied training and research experiences, networking, and developing bilingual, writing and speaking skills.

For the last activity of the day we organized an interactive discussion panel, moderated by Dr. José Miguel Justel, of Universia Puerto Rico, an online network of higher education institutions. During this activity, students shared their experiences and asked questions so that they could explore the ins and outs of science careers. The panel included science policy expert and member of the CienciaPR team, Dr. Giovanna Guerrero-Medina, Dr. Daniel Colón-Ramos, Dr. Alberto Rivera-Rentas, as well as Dr. Carlos Rinaldi (professor at the Department of Biomedical Engineering, University of Florida) and Dr. Carlos Ríos-Velázquez (professor at the Biology Department, University of Puerto Rico-Mayagüez). Questions included why the panelists decided to become scientists; the qualities they consider crucial to their success; how to overcome language barriers when seeking out research training opportunities; the challenges of achieving research funding; the advantages of doing an M.D./Ph.D. vs. just a Ph.D. or an M.D.; the importance of science career outreach in schools; the transition from a scientist to a principal investigator; the changing priorities for Ph.D. training programs, and how to transition from one field to another during the bachelors to Ph.D. stage.

Evaluation Design

Participant satisfaction with the symposium activities was evaluated through a survey handed out at the end of the day. The questionnaire included 24 questions pertaining to satisfaction with the talks and the information provided during the symposium, general demographic and academic information, interest towards a career in the biomedical sciences, and overall opinion about the symposium. The symposium had a total of 124 participants, of which 95 (77%) responded to the survey.

Findings

We were pleasantly surprised by the variety of campuses represented among participants. Students came from 15 different universities or college campuses, including the Interamerican University, San Germán and Metro Campuses; the University of Puerto Rico, Río Piedras, Ponce, Mayagüez, Bayamón, Arecibo,

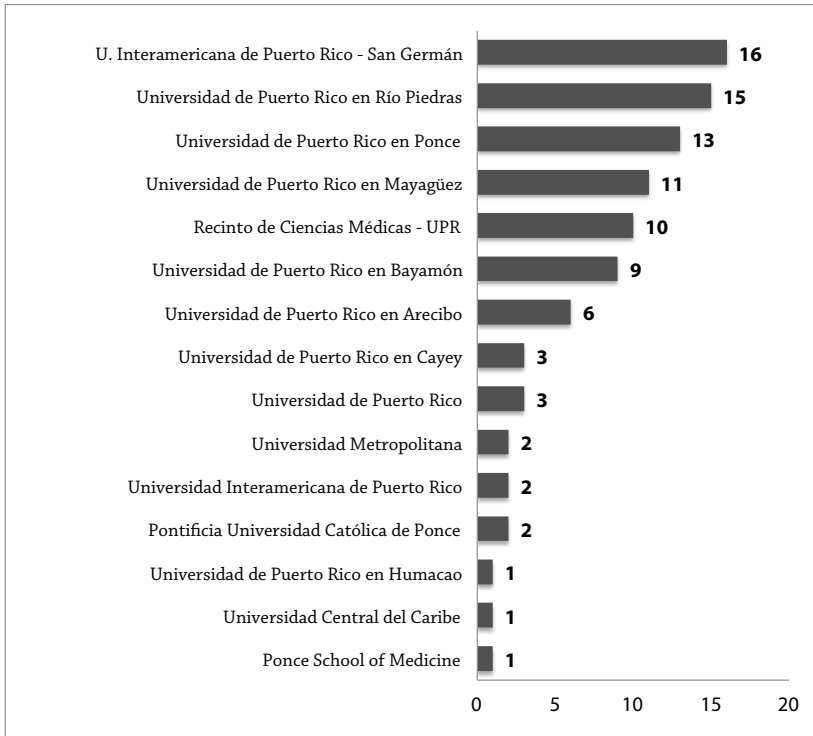


Figure 1. Academic institutions that were represented by participants at the Symposium.

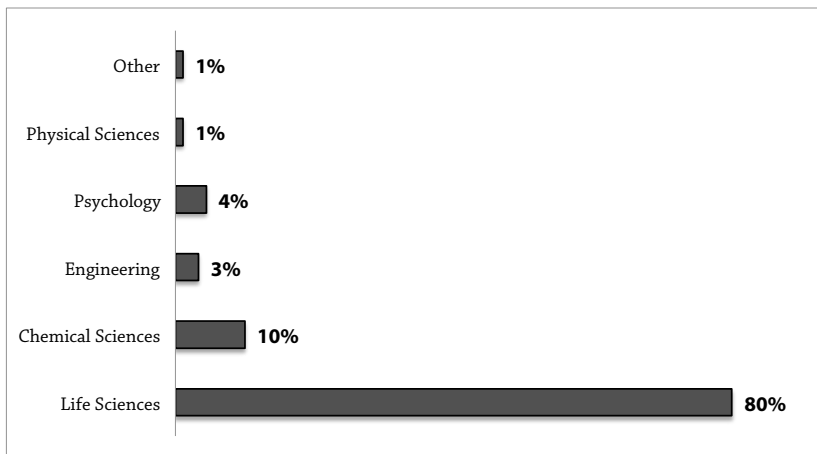


Figure 2. Fields of study of the participants at the Symposium.

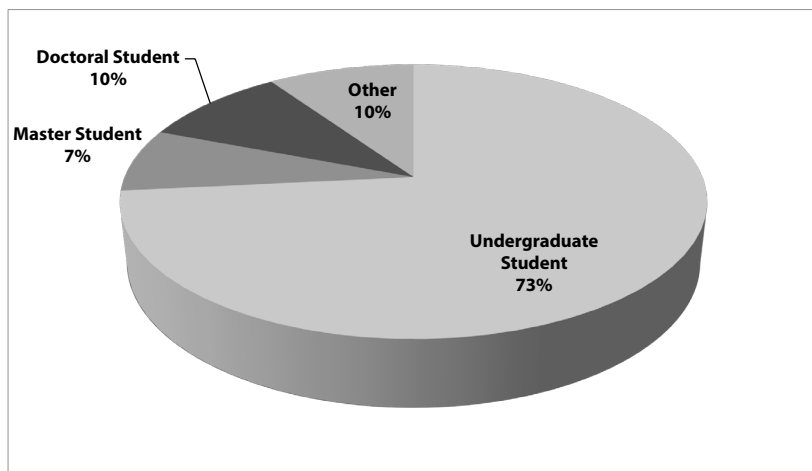


Figure 3. Academic level of the participants.

Cayey, Humacao, and Medical Sciences campuses; the Pontifical Catholic University of Ponce; the Metropolitan University; the Ponce School of Medicine, and the Central Caribbean University (Figure 1). Efforts to recruit from primarily biomedical programs were successful as a majority of participants reported life sciences as their field of study (80.0%, Figure 2). Most of the participants were undergraduate students (73.0%, Figure 3).

According to the survey, almost half of the participants (48.0%) were part of a training program like Minority Biomedical

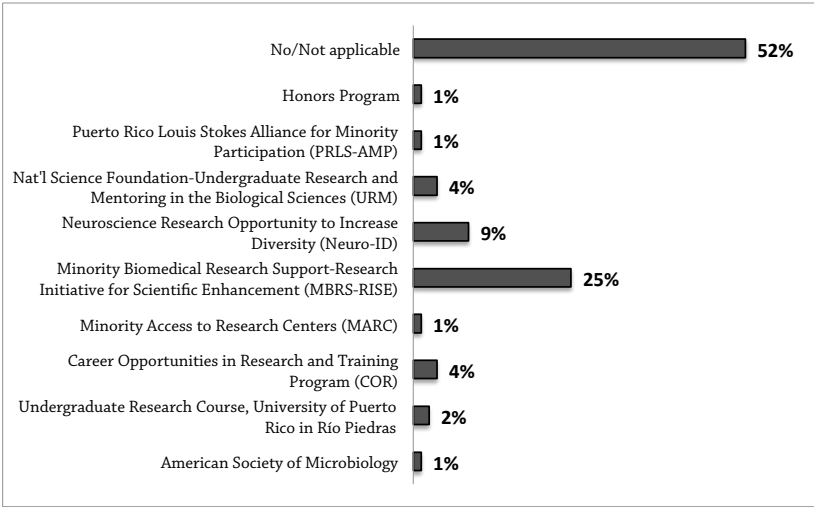


Figure 4. Specific training programs represented at the Symposium.

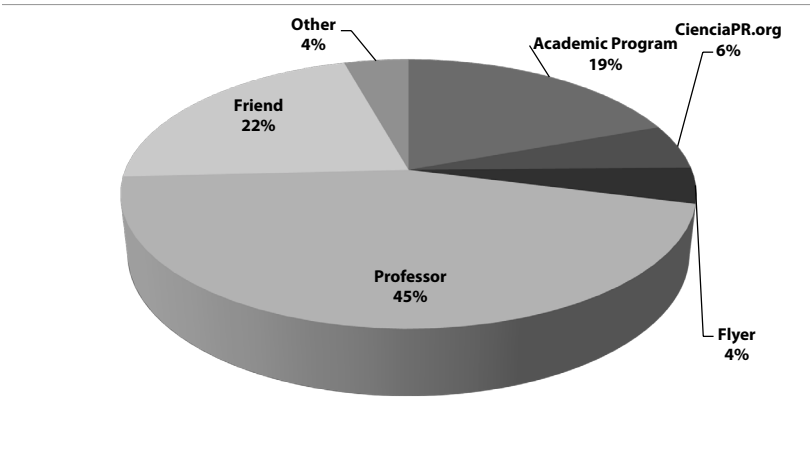


Figure 5. Sources of information about the Symposium.

Research Support – Research Initiative for Scientific Enhancement (MBRS-RISE, 21.0%) (Figure 4). The majority of the students found out about the symposium through professors (45.0%) or a friend (22.0%) (Figure 5). Almost three-quarters (74.0%) of the participants indicated they were not members of CienciaPR prior to attending the symposium.

Table 1

Overall satisfaction with the 1st Ciencia Puerto Rico Educational Symposium

QUESTIONS	On a scale of 1 to 5 please rate:				
	Poor				Excellent
	1	2	3	4	5
General opinion about the CienciaPR Educational Symposium	0%	0%	0%	15%	85%
General quality of the talks offered	0%	0%	0%	18%	82%
The information you received during the symposium	0%	0%	2%	15%	83%
Welcome talk/Presentation about CienciaPR.org	0%	0%	3%	16%	81%
Presentation about graduate school	0%	0%	1%	20%	79%
Networking lunch	0%	3%	9%	23%	65%
Presentation about research funding opportunities	0%	0%	4%	17%	79%
Panel about careers in the biomedical sciences	0%	0%	4%	16%	80%

In terms of overall satisfaction, the participants had a very positive opinion about the symposium (85.0% rated it with a 5, or excellent; 15.0% rated it with a 4) and were very satisfied with the information provided throughout the day (83.0% rated it as excellent) (Table 1). Ninety-nine percent (99.0%) of the participants said they would recommend the symposium to their friends or colleagues.

The majority of the symposium participants (90.0%) indicated that they were interested in a career in science. In addition, 87.0% indicated that the information they received during the symposium helped them clarify their interest in pursuing a Ph.D. in science. Moreover, more than half of the participants (53.0%) said that the information received during the symposium changed their mind about the scientific career they aspired to (Figure 6).

■ Recommendations From Written Comments

In the evaluation form we included three open-ended questions so that students could provide detailed feedback about the symposium. To analyze these qualitative data, the authors used standard

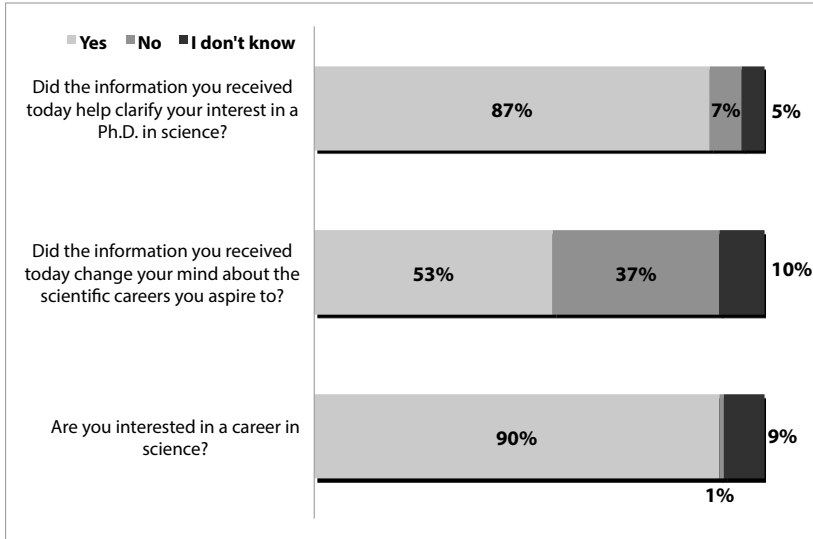


Figure 6. General question about the participants' interest in science

constant comparative analysis on the transcripts, analyzing the data line by line to identify recurring or unique topics or themes. These emerging themes were aggregated into response patterns (Bogdan & Biklen, 1998; Creswell, 2003; Denzin & Lincoln, 2005; Merriam, 1998).

The first question was: “Do you have any recommendations to improve the next CienciaPR Educational Symposium?” The most frequent response ($n = 15$) was that the symposium met its goals and that no improvements were needed. Another frequent response ($n = 12$) was to repeat the symposium on a yearly basis, for specialized audiences (graduate students or undergraduates, but not both because they have different needs and concerns), and in different university campuses so that more students could be reached. Most of the campuses of the public and private university systems in Puerto Rico offer 2-year and 4-year science related programs, but are geographically dispersed. The third most-frequent response ($n = 8$) was to address issues beyond graduate school, like postdoc options, entering into academia, building a research laboratory, other employment opportunities, among others.

Other suggestions included adding more information about graduate schools in Puerto Rico and abroad, such as selection and

application processes ($n = 6$), allowing for more interaction with the speakers through extended question and answer sessions ($n = 6$), and miscellaneous logistical improvements (faster registration, shorter breaks, more advertisement prior to the symposium, etc.).

The second question on the evaluation form was: “What other topics would you like to hear about in the next CienciaPR Educational Symposium?” By far, the most frequent suggested topic was about graduate school ($n = 26$), including identifying options in Puerto Rico and abroad, obtaining financial aid, managing language barriers and stress, contrasting between M.D., Ph.D. and combined M.D./Ph.D. programs, and identifying mentors. A second topic that was suggested by the presenters was “beyond the doctorate” ($n = 15$), that is, issues of careers, salaries, types of employment available, writing a CV, grant writing, publishing, and outreach.

Another topic was about “being a scientist” in specific disciplines ($n = 12$), like medicine, virology, public health, and the social sciences. Other topics of interest included research internships in Puerto Rico and abroad ($n = 10$), how to do research ($n = 4$), and recent scientific advances by Puerto Rican researchers ($n = 3$).

The last question was: “Do you have any additional comments about the CienciaPR Educational Symposium?” Here most of the comments were very encouraging and complimenting. Many of the same themes from the previous two questions reemerged in this section as well, especially the one about repeating and expanding the symposium, which reflects a clear need for this type of activity.

■ Conclusion

When Ciencia Puerto Rico designed the educational symposium: “I want to be a scientist... now what?” it had five main goals. The assessment data strongly suggests that the symposium achieved all intended goals. The participants’ responses were overwhelmingly positive and very appreciative of the activity and the information provided. The evidence is clear that a one-day, free symposium that combines pep-talks by young scientists (morning talks), information about financial resources for graduate school (afternoon talk), and interactive sessions with veteran

researchers (afternoon panel) was a great way to inform future scientists about their options and to open the doors for them to explore additional resources.

A limitation of this study was that we identified participants' satisfaction with the symposium only once, at the closing of the event. We did not measure baseline data or expectations. For future symposia, a validated pre- and post- assessment will be prepared. By administering these revised questionnaires at the beginning and closing of the symposium, it is expected that the author will have a more accurate measure to what extent the selected speakers, topics, and activities contributed to meet the goals of the activity.

There were a few lessons that we learned for future symposia and that could inform other institutions who want to use this approach to recruit and retain underrepresented students in the STEM disciplines. First, although we had a broad representation from various college campuses, about 75% of the participants came from the University of Puerto Rico system. Therefore we need to expand our advertising efforts even more to private universities in the island. Second, although the symposium was aimed mainly at undergrads, 27% of the participants were graduate students, suggesting the possibility of having some concurrent sessions aimed specifically at these two main groups. Third, the information about the symposium was spread mostly by faculty and friends, as opposed to social media like the CienciaPR website or its Facebook and Twitter services, which means that we need to improve the way to reach more students through both personal connection and electronic means. Finally, we learned that being geographically dispersed, as the CienciaPR Team is, was not an insurmountable challenge in organizing a successful graduate school orientation activity.

■ Acknowledgements

This workshop was funded by NIH grant G12 MD007600 to the University of Puerto Rico, Medical Sciences Campus RCMI program as well as a generous donation from the Amgen Foundation. D.C.-R. was funded by NSF grant IOS-1353845.

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