

AUTHENTIC PARTNERSHIPS: THE EXPERIENCE OF THE ARECIBO OBSERVATORY SPACE ACADEMY (AOSA). B. Aponte-Hernández¹, E. G. Rivera-Valentín¹, L. F. Zambrano-Marin². ¹Lunar and Planetary Institute (USRA), Houston, Texas 77058 ²Arecibo Observatory (UCF), Arecibo, Puerto Rico 00612.

Introduction: Authentic partnerships are an essential addition for the growth of programs. However, bonds like these do not happen overnight. They require intentional and constant nourishment to allow them to grow stronger. The sustenance that will keep partnerships strong after attaining it requires open communication, transparency, and a well-balanced relationship. These kind of actions in maintaining healthy partnerships were a principal component of the Arecibo Observatory Space Academy (AOSA).

The program: AOSA was a semester-long, out-of-school time supplemental education and research program for high school students in Puerto Rico. The mission of the program was to prepare students for careers in Science, Technology, Engineering, and Mathematics (STEM) via a student-centric immersive research experience. The program provided students with an independent and collaborative research experience on topics related to space and worked to aid in their individual academic and social development. AOSA's objectives were to: (1) Supplement the student's STEM education via inquiry-based learning and indirect teaching methods, (2) Immerse students in an ESL (English as a Second Language) environment, further developing their verbal and written presentation skills [1], and (3) Foster in every student an interest in science by harnessing their natural curiosity and knowledge in order to further develop their critical thinking and investigation skills. The program was motivated by the severe underrepresentation of Latinx students in STEM [2] and in particular the space and planetary sciences [3]. Additionally, during the lifetime of the program, no Puerto Rican university offered a degree or a study program (i.e., major or minor) in astronomy or planetary science, despite having the world's most powerful and most sensitive radar telescope, the Arecibo Observatory.

Over its four years of operations, the program successfully graduated over 150 students. Most (95%) college-aged students have gone to university to major in a STEM field, and many (70%) have chosen to pursue careers in the space and planetary sciences. Additionally, the program recruited and retained a binary gender balanced cohort. Many students have gone on to create space academic clubs within the University of Puerto Rico system and have led the establishment of formal education opportunities in the space and planetary sciences. AOSA students have not only succeeded academically, but they have become leaders in Puerto Rico and beyond.



Figure 2: AOSA students and staff by the Arecibo Observatory's radio telescope's dish.

Partnerships were an essential component of the program. The program fomented ties between the students, mentors, alumni, Arecibo staff, and the local community. Additionally, the program developed ties with the student's families and teachers.

Linking the community and the Arecibo Observatory opened doors to needed partnerships in order to provide meaningful impacts with the students. Schools and teachers, for example, were active collaborators that aided in connecting with students. The program also fomented projects that aided local schools and provided educational resources to the schools. As research has shown, family and peer influence should not be overlooked when engaging with Latinx students [4]. As such the program developed intentional ties with parents. It held an orientation meeting for only parents before the program started. It included checkpoints with families, as well as projects that included them.

The partnership between student and mentor relied on communication and authenticity to develop trust. Our mission was to motivate and facilitate student's futures. While the student's goal varied from one to another, they did have something in common, they were all interested in studying STEM related fields, but did not know how to go about it to pursue those careers. As such, the program, besides including supplemental STEM educational activities, also centered professional development. For example, students developed research proposals, which they presented to the class going from a typical 15-min presentation down to an elevator speech. This helped students identify the key components of their work and to learn to communicate it to a broader audience. Via peer-mentoring, students received additional insights into pursuing higher education within and beyond Puerto Rico (e.g., the application process, standardized testing, first-year experiences).

This is particularly important because many AOSA students would later become first generation college students and so they did not have access to familial experience in a university environment.

Lessons Learned: Although no partners are more important than others, some require additional attention and effort. Such was the case with the AOSA-parents partnership. Puerto Rico offers limited opportunities for science related fields, especially in the graduate level. As such, students would require at some point studies outside of Puerto Rico in order for them to pursue their desired careers. Puerto Rican culture is very family-centric and, as is often the case for island-based cultures, even small distances can be obstacles. This was the situation that was experienced by some of the students. Many parents were hesitant to allow them to go far from home for studies. This was also based on financial reasons, as constant travel, especially outside of Puerto Rico, can become very expensive. For these, and other reasons, many students were dissuaded from seeking opportunities that would allow them to pursue their chosen STEM paths.

Here is where the fruits of our labor came into play. The AOSA staff and parents, after a semester has passed, have at this point established a relationship. Transparency and open communication led them to trust the program and understand that it too is only looking for the best options to help their kids reach their potential. We helped them look at the pros and cons of the situation. We helped find scholarships and other funding sources to offset financial burdens. The relationship the program fomented with families truly became a partnership based on wanting what was best for the students.

Closing: Partnerships are in no way a perfect science, but collaboration and strategic partnerships are fundamental to accomplishing program goals. But as previously mentioned, these relationships do not just happen. They take time, effort, communication and transparency. These factor into the relationship fostering trust and respect. Without the partnerships developed in the Arecibo Observatory and taking into account the factors that maintain a healthy partnership, the program may not have had such a high success rate.

Recommendations: Bridging opportunity gaps faced by high school students from historically excluded and oppressed communities through supplemental educational and experiential programs requires building authentic partnerships. Programs must acknowledge individual and group needs and cultural differences to be truly successful.

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