

IAC-19.E1.6.6x54835

Building Foundations for International Collaboration through Educational Outreach Initiatives

Mr. Carlos Fontanot^a, Mr. Erik López^b, Mr. Juan López^c, Ms. Ana Cristina Olvera^d, Mr. Guillermo Castro^e, Ms. María José Viñas^f

^a National Aeronautics and Space Administration (NASA), Johnson Space Center, United States, carlos.fontanot-1@nasa.gov

^b NASA Johnson Space Center, United States, erik.lopez@nasa.gov

^c NASA Johnson Space Center, United States, juan.miners@gmail.com

^d Dirección General de Televisión Educativa (DGTVE), Mexico, anacristina.olvera@tveducativa.gob.mx

^e Agencia Espacial Mexicana (AEM), Mexico, institucional.aem@gmail.com

^f NASA Headquarters, United States, mj.vinas@nasa.gov

Abstract

As human space exploration pursues journeying to the Moon and Mars, international and intercultural collaboration is key for the success of such ambitious goals. Since 2014, NASA's Johnson Space Center (JSC) Hispanic Employee Resource Group (HERG) has established relationships and participated in outreach events with emerging space organizations in Latin America with educational and public outreach as a common goal. Such efforts align with strategic goals to empower the next generation of innovators and explorers and to champion the development of space exploration capabilities.

This paper discusses the partnerships developed to introduce Spanish speaking populations to science, space technology, aeronautics, research and development through television, webcasts and social media. The authors share accomplishments, challenges, and lessons learned to build foundations for international collaboration to ignite research and innovation and propel human space exploration. The methodology makes use of Space Act Agreements to leverage existing outreach materials and programs and translate the content into Spanish for the benefit of students, educational organizations and the public in general.

The plan is to apply the same model in other regions and countries to create a Latin American network of language translation and diffusion of science and space technology content targeting emerging space sectors. This model could be used to reach out to other international communities to provide cultural and educational outreach for space exploration and research.

Keywords: (maximum 6 keywords): Spanish Language; Cultural Outreach; Space Act Agreement; International Collaboration; Hispanic; Science, Technology, Engineering, and Math (STEM)

Acronyms/Abbreviations

Agencia Espacial Mexicana (AEM – Mexico's Space Agency); *Canal Satelital Iberoamericano* (Ci – regional television channel for Ibero-America), *Consejo Nacional de Ciencia y Tecnología* (CONACYT - Mexico's National Council for Science and Technology); *Dirección General de Televisión Educativa* (DGTVE – Mexico's General Directorate of Educational Television), English Language Learner (ELL), Hispanic Employee Resource Group (HERG); Johnson Space Center (JSC), *Muestra Nacional de Imágenes Científicas* (MUNIC – Mexico's National Exhibition of Scientific Images), National Aeronautics and Space Administration (NASA); National Center for Women & Information Technology (NCWIT), White House Office of Science and Technology Policy (OSTP); Science, Technology, Engineering, and Math

(STEM) *Secretaría de Educación Pública* (SEP - the Ministry of Public Education of Mexico).

1. Introduction

As human space exploration pursues journeying to the Moon and Mars, international and intercultural collaboration is key. The National Aeronautics and Space Administration (NASA) has consistently put forward efforts for awareness of science, technology, engineering and math (STEM) with students and the public. The agency has also encouraged its workforce to maintain a pipeline to engage the future generation of engineers and scientists.

In 2014, the Hispanic Employee Resource Group (HERG) at NASA's Johnson Space Center (JSC) began establishing relationships and conducting outreach events with emerging space organizations in

Latin America to share the message of space and create engagement around STEM. As a result of these efforts, partnerships have been formed between NASA, the Mexican Space Agency, *Agencia Espacial Mexicana* (AEM), the Educational Television Directorate of the Mexican Ministry of Public Education, *Dirección General de Televisión Educativa* (DGTVE), and Mexico's National Council for Science and Technology, *Consejo Nacional de Ciencia y Tecnología* (CONACYT) with educational and public outreach as a common goal. Such efforts align with strategic goals to empower the next generation of innovators and explorers, and to champion the development of space exploration capabilities. These partnerships have resulted in multiple collaborative projects, such as:

1. The NASA Hispanic Engagement Campaign for the White House Initiative on Educational Excellence for Hispanics.
2. Yearly support of Mexico's CONACYT Week of Science and Technology in Mexico City.
3. Ongoing production and broadcasting of *Espacio a Tierra*, a weekly video produced originally in English under the name "Space to Ground" by Public Affairs at NASA JSC and translated into Spanish. This program summarizes the activities on board the International Space Station (ISS).

The success of these initiatives can be used as a blueprint for future partnerships.

1.1 The importance of creating new international partnerships

NASA is committed to landing American astronauts, including the first woman and the next man, on the Moon by 2024. This objective is the next step of a series of strategic goals aligned with the agency's vision "to discover and expand knowledge for the benefit of humanity."

As part of NASA's Artemis Program, the Moon missions in 2024 will demonstrate new technologies and capabilities. Artemis is expected to engage international and commercial partners through innovative approaches in both technology and business practices that enable space access and services [1]. The program is part of a strategy to build a sustainable economy in low-Earth orbit, the Moon and beyond, led by American industry [2].

The creation of innovative solutions to achieve NASA's exploration objectives presents opportunities to collaborate with emerging space markets around the world. This paper presents some of the institutional

and grass-roots approaches that NASA has taken to engage these markets, with an emphasis on Spanish-speaking communities in the United States and internationally.

1.2 Why target Spanish speaking communities?

Spanish is the second most spoken language in the U.S. [3]. In order to maintain America's leadership in space and gain the support of our stakeholders, it is essential that NASA actively find new ways to earn engagement with Hispanic communities.

Students of Hispanic heritage comprise the largest minority group in the U.S. school system: almost 20 percent of the country's youth population identifies as Hispanic [4]. For the 2016-17 school year, Spanish was the home language of 3.79 million English Language Learner (ELL) public school students, representing 76.6 percent of all ELL students and 7.7 percent of all public K-12 students [5]. It is estimated that Hispanics will comprise 30% of the U.S. population by the year 2040 and will become the largest ethnic group by that date [6].

Internationally, Spanish has an enormous presence, with over 477 million native speakers world-wide as of 2017 [7]. According to the British Council's Languages for the Future, Spanish is the number one language other than English that United Kingdom speakers need to be able to use, followed by Mandarin, French, Arabic and German [8].

In addition, Latin American countries are home to significant potential human capital for STEM-related careers. For example, even though it is the most populous Spanish-speaking country in the world, at a 2017 population of 123.5 million, Mexico has less than 40% of the population of the United States (326 million in 2019) [9, 10]. Nonetheless, due to significant investment in tuition-free universities, Mexico graduates more than 90% of the number of engineering students that U.S. universities graduate every year [11, 12]. Fig.1 shows the relative number of engineering graduates of the U.S. and Mexico as well as the relative populations.

Latin American countries have the potential to be meaningful space participants as they further develop their emerging space sector through educational and technical collaborations with NASA.

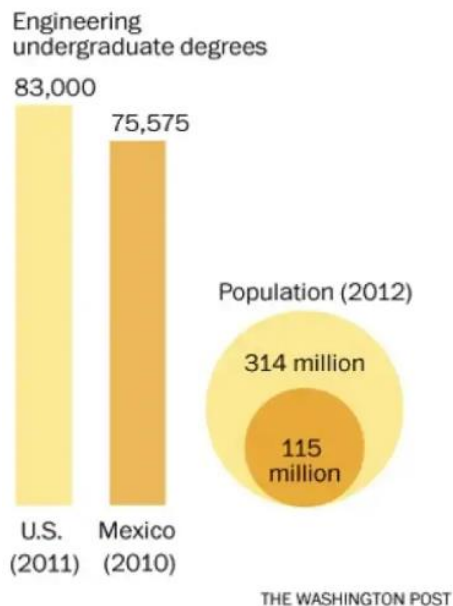


Fig. 1. Engineering Graduates in U.S. and Mexico versus population [11]

1.3 Communication and educational outreach as effective partnership tools

Given the importance of connecting with Spanish-speakers at home and abroad, the first task was to find an effective set of partnership tools for raising awareness. Communication and outreach have been primary components to beginning collaboration and establishing relationships. By providing space-themed content in Spanish, NASA actively reaches out to underrepresented communities in the U.S. and to potential partners internationally, demonstrating the agency's commitment to inspire, educate and partner with a broad range of Spanish-speakers.

In addition to spreading the message of space and communicating opportunities provided by STEM careers, space-themed products can also be used to promote and teach the Spanish language in the classroom. Data from 2011 shows Spanish as the most frequently taught language of instruction in foreign language immersion programs in the U.S., with more than 230 programs around the country, representing 45% of the total number of such programs [13].

Space-themed educational content in Spanish is currently available and free to download through multiple NASA outlets. Generally, the team presenting and promoting this material are of Hispanic background. The cultural similarities between the presenter and the audience, as they sometimes share the same native language or country of origin,

potentially shares the NASA message at a deeper and more personal level.

When participating in a variety of STEM engagement events around the state of Texas, NASA representatives frequently encounter educators and parents who express high interest in this type of educational resources and more often than not request copies of the materials. By providing easy access online to this type of content, and by developing ongoing partnerships with a wide variety of programs both within the U.S. and internationally, the expectation is that students will be inspired to pursue STEM careers and that new space-related projects will emerge among scientists, engineers, and entrepreneurs in Latin America.

2. Engaging Spanish Speaking Communities

2.1 NASA Johnson Space Center's Hispanic Employee Resource Group

NASA's Johnson Space Center (JSC) places a priority on diversity and inclusion, demonstrating its commitment at the highest levels of the organization. Through its Employee Resource Groups (ERGs) – voluntary grassroots groups of employees that share a purpose, interest, or background – JSC actively partners with and builds constructive relationships with schools, community-based organizations, small businesses, and professional associations to expand outreach to diverse communities.

The Hispanic Employee Resource Group (HERG) at the NASA Johnson Space Center is a member-based organization established in the 1980's for NASA JSC employees and its associated contractor workforce. The HERG promotes the development, inclusion, and innovation of JSC's workforce with a focus on personnel of Hispanic descent.



Fig. 2. Members of the HERG receiving the 2018 JSC Director Innovation Team Award

The HERG supports NASA's mission by strengthening recruitment, on-boarding, and outreach activities related to the Hispanic community. The group is guided by the principles of investing in the development of a Hispanic workforce in STEM, extending cultural awareness in the technical community, and leveraging the strengths of our members in partnership with the Hispanic community to realize the full potential of NASA as a STEM organization.

The HERG is composed of a network of over 300 employees from all technical disciplines across NASA – engineering, mission control, program offices, procurement, human resources, etc. These employees have a broad range of ethnic and cultural backgrounds. Thanks to this diversity, the HERG championed NASA's relationships with emerging markets in Latin America, starting with Mexico and its space agency, *Agencia Espacial Mexicana* (AEM).

The timeline below illustrates key events, led by the HERG, aligned with this vision. Further details are presented in the following sections of this paper.

- **2014:** supported interchange meeting at NASA JSC with Mexican Delegation
- **2015:** engaged partners in the White House Initiative on Educational Excellence for Hispanics, resulting in recognition from President Barack Obama
- **2015:** pilot program for *Space Lotería*. This game, similar to Bingo, was piloted at several internal JSC employee events and at the 2015 Hispanic Engineering, Science and Technology week for an audience of approximately 3,000 middle school students and educators.
- **2014-2018:** Supported Mexico STEM Week event in Mexico City as channel to foster and expand relationships
- **2016:** Partnered with Televisa Foundation and Univision on TECHNOLOChicas and SciGirls, U.S. national initiatives to raise awareness among Latinas about opportunities for careers in STEM.
- **2017:** Through a Space Act Agreement (SAA) between NASA, the Mexican Space Agency (AEM), and the Mexican Secretariat of Education (DGTVE), began producing the Spanish version of the weekly NASA "Space to Ground" video segments that air on NASA TV and are webcast as well. The Spanish version of the program, *Espacio a Tierra*, is disseminated through public and private

media sectors in Mexico, Latin America, Spain, and the U.S.A. It reaches approximately 42 million viewers.

2.1 Description of Activities

2.2.1 Space Lotería

With an active volunteer base that routinely participates in K-16 community outreach, the HERG needed a tool that would communicate the value of NASA in culturally relevant ways.

Lotería is a well-known game from Mexico similar to Bingo, which uses iconic images on a deck of 54 cards for a caller and a 16-image grid for each player. The caller randomly selects a card from the deck and announces it to the players by its name. The players look for a match on their grids and cover it with a marker. The first player with four images in a horizontal, vertical or diagonal row, squared pattern, any other previously specified pattern, shouts "¡Lotería!" and wins the game.



Fig. 3. *Space Lotería* Game Banner

The HERG developed a space-themed *Lotería*, replacing the traditional images with images representing NASA, space, science and technology. The cards provide both the English and Spanish names for the images. The back of the caller cards contain a related "fun fact" in both English and Spanish that help tell NASA's history, present, and future exploration. The banner used to advertise the game is provided as Fig. 3 and a sample game card is shown as Fig. 4.



Fig. 4. *Space Lotería* Example Game Card

The game was piloted at several internal JSC employee events and at the 2015 Hispanic Engineering, Science and Technology week for an audience of approximately 3,000 middle school students and educators.

Employees and educators alike have shown significant interest in acquiring the materials for use in classrooms, STEM events, and family science nights in local communities around the country.

2.2.2 CONACYT's Mexico's STEM Week

The *Consejo Nacional de Ciencia y Tecnología* (CONACYT) is a Mexican government agency that manages scientific and technological activities. Every year, CONACYT coordinates a week-long series of events entitled *Semana Nacional de Ciencia y Tecnología*, or “Mexico’s STEM Week,” to promote science and technology with the Mexican public. The event is typically hosted in Mexico City, attracting over 200,000 people throughout the week.

In 2014, NASA received an invitation to attend the event as a special guest. The event was an opportunity to expand and foster relationships and identify other areas of opportunity for collaboration, some of which are described in this paper. Since then, NASA has supported this event every year with representatives directly interacting with over 30,000 people every year.

2.2.3 Support for *Technolochicas* and *SciGirls*

Technolochicas and *SciGirls* are two national initiatives to raise awareness among Latinas about careers in STEM. Latinas are one of the fastest-growing populations in the U.S., but occupy only 2 percent of the jobs in the computing workforce in 2016, making them a vastly untapped talent pool [14].

Technolochicas uses the unique stories of Hispanic women to recognize the power of innovation to change the world and relate to real-life role models [15]. This website is an initiative of the National Center for Women & Information Technology (NCWIT) and the Televisa Foundation that includes online profiles and in-person events, currently highlighting 5 NASA role models. In person events focus primarily on female middle school age students, with group sizes between 150-400 students, with additional participation from community education groups.

SciGirls is an Emmy award-winning PBS Kids television show, website, and educational outreach program that draws on cutting-edge research about what engages girls in STEM learning and careers [16]. Four *SciGirls* episodes highlight NASA themes, including a *Space Squad* episode from the Latina-focused and culturally-responsive fourth season that includes learning from the first Hispanic woman ever in space, Ellen Ochoa.

The *SciGirls* program is sponsored by the Twin Cities Public Broadcasting System and funded by the National Science Foundation. In combination with multiple websites, hands-on activities, and professional development workshops, this resource reaches millions on the air, online and in communities to inspire the next generation of STEM superstars [17]. *SciGirls*' multiple PBS platforms provide a massive reach, including the following:

- PBSLearningMedia.org reaching 1.5 million educators annually
- *SciGirls*' popular PBSKids mobile/online presence (reaching 5 million users annually)
- The *SciGirls* educator network of 175+ girl-serving STEM educational organizations (reaching tens of thousands of girls annually).

The PBS *SciGirls* television series has garnered over 39 million viewer impressions across its first three seasons, and its award-winning outreach team has trained 3,000+ educators to provide gender-equitable STEM learning to more than 60,000 youth nationwide.

To contribute to these and other programs, the HERG supports women in STEM by providing female NASA employees as speakers for media and outreach events. In addition, this proactive team works with other organizations within the center to tackle women-focused events and workshops. By participating in programs like *Technolochicas* and *SciGirls*, participants find synergy and forge new partnerships to support bilingual STEM content in both English and Spanish. These efforts help spread the NASA message

to unite, inspire, and impact a new generation of women in STEM.

2.2.4 *Espacio a Tierra*

2.2.4.1 ¿What is *Espacio a Tierra*?

Espacio a Tierra is the Spanish version of Space to Ground, a weekly video produced by NASA's Johnson Space Center to communicate activities on board the International Space Station and the latest space news.

Espacio a Tierra began as an in-house effort undertaken by the HERG to celebrate Hispanic Heritage month, September 15th to October 15th for 2015. Since the Spanish-speaking community is the largest minority group in the United States of America, the HERG reached out to Mexico, seeking to establish an international collaboration to carry on with the initiative and serve both groups. The AEM answered this call with the intention of bringing educational content on space science and technology to audiences in Mexico, Latin America and Spanish-speaking countries elsewhere in the world. AEM asked the General Directorate of Educational Television, or *Dirección General de Televisión Educativa* (DGTVE) of the Ministry of Public Education of Mexico, or *Secretaría de Educación Pública* (SEP), to undertake the task of producing *Espacio a Tierra* and broadcasting it to all of Mexico and Latin America.



Fig. 5. Ana Cristina Olvera hosting *Espacio a Tierra*

After a year of negotiation and lobbying, a “Nonreimbursable Space Act Agreement Between The National Aeronautics and Space Administration of the United States of America (on the one hand) and the “Agencia Espacial Mexicana” and the “Dirección General de Televisión Educativa” of the United Mexican States (on the other) established for

Collaboration on Translating and Disseminating ISS News and Activities” was signed by the three institutions on January 30, 2017. From then on, the weekly videos have been produced in DGTVE's studios in Mexico City, shared with both partners, NASA and AEM, and distributed through national and international television channels and social media outlets. To date, more than 120 short videos have been produced and disseminated through various outlets.

2.2.4.2 *Espacio a Tierra* broadcast on DGTVE's television outlets

The Space Act Agreement (SAA) developed for producing *Espacio a Tierra* was part of a historic effort to increase regional collaboration through the creation of *Canal Satelital Iberoamericano* (Ci), the first satellite television channel developed to reach all of Latin America and the Iberian Peninsula. The Ci was created through the initiative of the Latin American Institute of Educational Communication or *Instituto Latino-americano de la Comunicación Educativa* (ILCE), the Association of Educational and Cultural Television Networks, or *Asociación de las Televisiones Educativas y Culturales Iberoamericanas* (ATEI), and the DGTVE. A map of Ci outlet coverage is provided in Fig. 7.

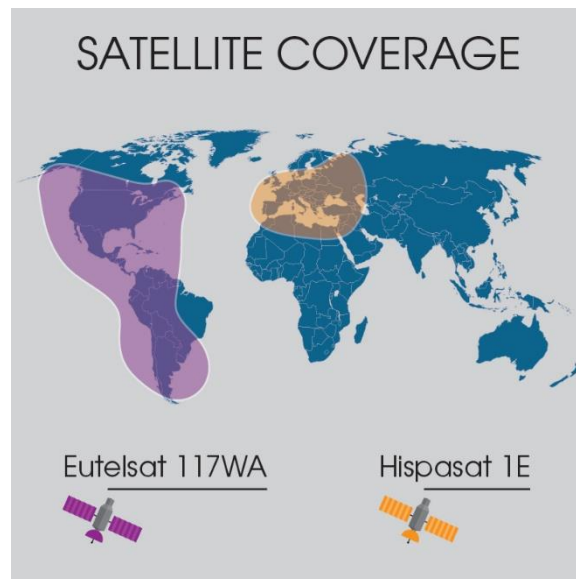


Fig. 6. Signal coverage for *Canal Satelital Iberoamericano* and *Iberoamérica al Día*

The Ci aims to be an audiovisual window for content under the principles of objectivity, truthfulness, ethics, plurality, equity, inclusion, and full respect for human rights. This commitment

affirms the cooperation and collaboration between television networks and cultural and educational institutions of Ibero-America. The signal is broadcast through satellite television and internet websites with a potential audience of 58 million people in 22 countries, including all of Latin America, Spain, Portugal and Andorra.



Fig. 7. Canal Satelital Iberoamericano Outlet Locations

Within this effort, the newscast *Iberoamérica al Día* was created as the first original content of Ci, with the objective of disseminating up-to-date reporting, interviews and analysis of the most relevant events taking place in the region and the international agenda. With the aim of contributing to the understanding of the Ibero-American reality and the creation of a regional identity, *Iberoamérica al Día* was designed to

be a place to share the audiovisual content for issues of science, technology, culture, health, human rights and the environment, created by public and educational television stations within the cooperation network, as well as by the members of the ATEI. An outlet map for the newscast is provided in Fig. 8. *Iberoamérica al Día's* youtube channel registered a more than 280,000 views.

Espacio a Tierra was broadcast through DGTVES' public (*Ingenio TV*) and cable (*Aprende TV*) signals. The segment, focused on science technology and innovation, was integrated in the newscast every Monday from January 30, 2017 to March 15, 2019, when the newscast ended its broadcast.

The collaboration started with a pilot program, which consisted of the production and dissemination of a biweekly short video broadcast through *Iberoamérica al Día*, without the logos of the institutions, to see how audiences would react to its specialized content. The result was positive, and, by the time the SAA was signed, 20 episodes had already been broadcast.

2.2.4.3 Broadcast Alliance with Canal Universitario ZOOM of Colombia

Canal Universitario ZOOM of Colombia, is a television network with an educational, cultural and social focus. Its main goal is to disseminate the knowledge that public universities produce around the country and to create audiovisual content with significant intellectual and social value. Currently 52 Colombian private and public universities participate in the productions broadcast by this network.

As part of the network of educational television channels, *Canal ZOOM* requested *Espacio a Tierra* for inclusion in their programming. They broadcasted episodes originally transmitted weekly from July 17, 2017 to October 16, 2017 twice a week on Tuesdays and Wednesdays from March 6, 2018 to May 30, 2018.

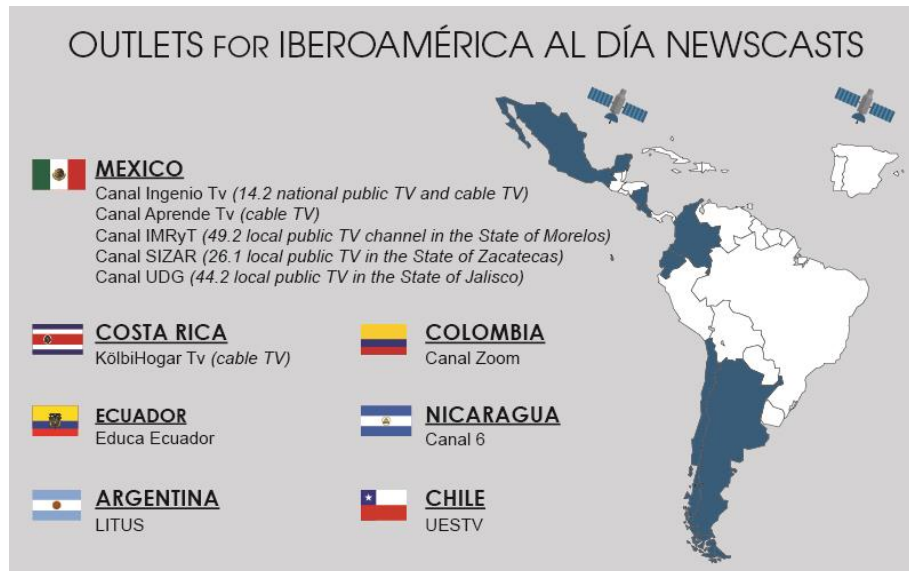


Fig. 8. Iberoamérica al Día Newscast Outlets

2.2.4.4 Espacio a Tierra selected for MUNIC Exhibit

In 2017, *Espacio a Tierra* was selected for the Second National Exhibition of Scientific Images, or *Muestra Nacional de Imágenes Científicas* (MUNIC), under the category "Scientific and Technological Outreach in Audiovisual Format." MUNIC seeks to encourage the creative industry of Mexico towards a culture of science and technology through images, sound and audiovisual content to encourage scientific-technological and innovation vocations in the school-age population. The event was held on April 3, 2017, at the Film Library of the *Universidad Nacional Autónoma de México* (UNAM) and then additional showings of the featured films toured the Mexican republic.

2.2.5. Additional Space Act Agreements that foster international connections

2.2.5.1 NASA International Internship (I²) Program

NASA currently has active SAAs with twelve countries all over the world to provide opportunities for talented STEM students to complete an internship or fellowship at a NASA center [18]. Students must be able to demonstrate that they are proficient in English, have a minimum 3.0 grade point average (or equivalent) and are interested in working in the aerospace field. Participating Latin American countries include Mexico and Brazil. Responsibilities for each country are described in the individual Space Act Agreements.

By having students participate in meaningful NASA projects, the U.S. and participating countries foster cross-cultural understanding and provide a collaborative environment for working together. International interns (university undergraduate-level students) or fellows (university graduate-level students) work alongside their U.S. peers on research and engineering opportunities, applying the knowledge and skills they have learned to real-world problems while also expanding their understanding of cultural interactions and relationship building.

2.2.5.2 AztechSat-1 Cubesat Communications Technology Demonstration Space Act Agreement

A NASA/AEM Space Act Agreement that exemplifies bilateral collaboration between agencies is the AztechSat-1 CubeSat technology demonstration, which provides NASA with a valuable opportunity to test economical, commercial off-the-shelf components that may be useful in future space missions. Under this agreement, AEM has the opportunity to develop requirements, manufacture a prototype, ground test the prototype, deliver a flight certified unit, lead mission operations, and share flight data with NASA.

AztecSat is currently scheduled to fly no earlier than December 2019 on SpaceX Commercial Resupply Services (CRS)-19.

2.2.5.3 CineSpace Space Act Agreement

In 2015, NASA and the Houston Cinema Arts Society combined forces through a Space Act Agreement to create CineSpace, a short film competition that offers filmmakers around the world the opportunity to share their works inspired by and using actual NASA imagery from the vast archives that are readily accessible to the public. Filmmakers are given the opportunity to submit a short film of 10 minutes or less duration that contains at least 10% NASA footage. Winners receive monetary prizes and are announced at the annual Houston Cinema Arts Festival. Competing films may also be screened at other film festivals around the world and even in space on the ISS.



Fig. 9. Poster for CineSpace 2019

CineSpace is currently in its fifth edition. Since its inception, more than 1700 films have been submitted for consideration. Among them, dozens of films have participated from Latin America and Spain and several films have received awards in different categories. The competition has become so popular that CineSpace films with Spanish subtitles have been presented during film festivals in several cities in Mexico. During these events, NASA CineSpace representatives address the audience and answer questions about the films, space, technology and NASA programs, reaching out to students and the public and encouraging them to pursue careers in STEM disciplines. Facilitating the use of imagery

from vast collections of historic NASA footage gathered over the last 60 years has proven to be an outstanding vehicle to educate the public on space, aeronautics and technology, not only in the U.S. but in Spanish-speaking countries and throughout the rest of the world as well.

Given that filmmakers from more than 60 countries have participated in the last five years in this competition, this program demonstrates the value of imagery as a vehicle to draw communities from around the world into NASA's orbit and help spread NASA's message. Many of the films are being used in schools, museums and other institutions for educational purposes, showcasing unique space images and breathtaking views of our planet from Space.

2.2.6 Spanish Engagement within NASA

2.2.6.1 Spanish-language websites and social media

NASA's Science Mission Directorate (SMD) runs *Ciencia*, a Spanish-language website on NASA's scientific discoveries. *Ciencia* provides new weekly content on Earth science, the Universe, research conducted on board the International Space Station, and NASA Hispanic employees. It also serves as a hub for finding other NASA pages in Spanish.

SMD relies heavily on social media to promote *Ciencia's* content. NASA's first social media account in Spanish, its Twitter account @NASA_ES, was launched in 2011. A YouTube account followed in September 2018, and a Spanish-language Instagram account launched in July 2019. The strongest social media initiative to date based on followers, is the Twitter account: as of Oct. 2, 2019, it had 442,000 followers, making it larger than those of some NASA centers. The gender distribution of the followers is slightly skewed towards male (58% v. 42% female) and over half of these followers live in Mexico and Spain according to Twitter analytics.

Content that works particularly well with our Twitter audience focuses on a person or country. For example, one tweet about Costa Rican engineer Sandra Cauffman was retweeted by Costa Rica's president. Other popular content includes tweets related to anniversaries, those that include striking imagery and those that are highlighted by NASA's flagship account. A particularly successful campaign was a collaboration with a popular Latina singer, Karol G, to promote NASA's Spanish-language social media presence, which brought in thousands of new followers and received significant coverage by entertainment media. It is worth mentioning that this

content is often distributed by U.S. embassies in Spanish-speaking countries. In addition, anecdotal evidence suggests that the tone of the replies received in response to this content is more positive than that of some other NASA social media accounts.

NASA's latest social media initiative in Spanish, its NASA_ES Instagram account, targets a younger demographic. As of Oct. 2, 2019, 50% of our over 33,000 followers were under 25 years of age. The gender distribution of these followers is almost balanced (47% women, 53% men) and almost half of them are in Colombia, Mexico, Spain, Argentina and Chile.

2.2.6.2 NASA Headquarters-led Spanish Communications

In April 2019, NASA's Science Mission Directorate launched a planning project to lay the groundwork and gauge the feasibility for coordinating and expanding NASA's science communications in Spanish. This initiative aimed to be a blueprint for an expanded pilot project in FY 2020.

The target audience is not only the Hispanic population in the U.S., but also Spanish speakers in other countries with whom NASA has ongoing collaboration.

Historically, most of NASA's communications in Spanish had been carried out on an ad hoc basis by volunteers, producing limited content with no overarching strategy or quality control. This planning project aimed to compile and evaluate the quality of and assess growth possibilities for all existing NASA communications in Spanish plus suggest future targets and initiatives.

The program relies heavily on the use of social media and multimedia to reach younger audiences (discussed in 2.2.4.1) and, among other projects, has launched a successful new series of video profiles of Hispanic NASA scientists and engineers to inspire students to pursue STEM careers. The program also includes a focus on reaching Spanish-language media by increasing the availability of Spanish-speaking NASA experts for live interviews through NASA's successful LiveShots program and training Spanish-speaking NASA scientists and engineers to talk to journalists.

To celebrate the 2019 Hispanic Heritage Month, SMD's Spanish program launched "Hispan@s de la NASA," a new series of video profiles that showcase the careers of NASA Hispanic scientists and engineers and aim to inspire Latino students to pursue STEM careers. The initiative has been successful: the first

three published videos have received almost a quarter million views on social media and are currently being broadcast on NASA TV. These profiles are under consideration for showcasing in NASA visitor centers.

New initiatives, such as the production of Spanish-language materials for NASA Visitor Centers in the U.S. and Spain, as well as a collaboration with the National Air and Space Museum, will launch in FY2020.

2.2.6.3 NASA JSC Space Station Contract Spanish Engagement Efforts

The Mission and Program Integration (MAPI) contract serves many functions supporting the International Space Station (ISS) program, including communicating the latest research highlights aboard the orbiting laboratory. One of MAPI's goals is to amplify NASA's audience and raise awareness about ongoing science and other activities aboard the station.

MAPI has been responsible for uploading *Espacio a Tierra* to YouTube, sharing it through Twitter, creating a closed caption file, and uploading it to images.nasa.gov where anyone can download it from the web. *Espacio a Tierra* represents the bulk of the Spanish content in social media.

MAPI has also supported Spanish efforts through educational outreach events. Using a wide variety of platforms to reach out to students, outreach events play a key role in communicating ongoing activities related to ISS research. MAPI has translated and produced Spanish versions of different ISS outreach products, including ISS posters, bookmarks, an activity book for grades K-5, as well as other assets that help students and educators to learn about NASA's mission while practicing another language. Perhaps more importantly, MAPI employees of Hispanic heritage are among those that support these outreach events, acting as role models for students as they discuss the science and technology activities of the ISS.

During the nine-month period from October 2018 to June 2019, more than 20% of MAPI's outreach events included a Spanish component targeting Hispanic students and teachers in the U.S. One opportunity making this possible was partnering with Communities in Schools-Texas Joint Venture (CIS-TJV). This organization serves underrepresented students and their families, many from a Hispanic background. Because of these conscious efforts, MAPI has been able to reach more students and their families in their native language.

Another area of MAPI impact is the Ham Radio program. In 2017, the first educational Ham Radio

contact was made in Venezuela, where students interviewed NASA astronaut Joe Acaba in Spanish while he orbited the Earth on the International Space Station. This program opened an opportunity to create products around that story that were relevant to Spanish-speakers in the U.S.

3. The Future of Spanish Engagement at NASA

The HERG at NASA's Johnson Space Center has been successful over the last several years in reaching out to the Hispanic Community in the U.S. The group has also seen success in establishing strong working alliances through educational, media and aerospace organizations to further relationships with Latin America.

Based on this model, the same principles will be continued through established contacts. Further expansion is envisioned in other regions and countries to create a Latin American network of language translation and distribution of science and space technology content. As an example, initial discussions have taken place with the Latin American Educational and Cultural Television Association to identify regularly-produced NASA programs to be translated and produced in Spanish using the *Espacio a Tierra* model.

Other opportunities to expand our working relationships include pursuing technical and aeronautical conferences in the Spanish-speaking world to bring NASA's presence and programs to these forums and open the doors to potential collaboration and partnership.

NASA's current direction is to commercialize Lower Earth Orbit, especially through the ISS Program. Making Latin American countries aware of these opportunities will be part of the outreach portfolio.

Many technical disciplines are not specific to the aerospace realm. For example, the television industry is a world-wide enterprise that focuses on broadcasting, news, and entertainment. Television is also an integral part of life in space, as demonstrated in the ISS with its live television capability and vast array of commercial-off-the-shelf equipment on board.

The television industry is interested in NASA's activities in space and at times has provided hardware to the space station. Currently, the recently created Gateway Program has engaged the U.S. television industry to partner on equipment to be deployed on the Lunar Orbital Modules and on the lunar surface. There are many opportunities to participate in television and broadcasting conferences and seminars world-wide,

including in Hispanic countries, not only to address technical needs but to partner with this industry on future requirements as we embark in new programs such as Artemis and the voyage to Mars.

While many of the activities conducted by the HERG and other individuals have relied on volunteer time, other efforts have been included as part of the outreach goals of a contract. Where SSAs have been drawn up, funding decisions, allocations, and responsibilities are clearly defined for each affected country. Having funding available can be key to assuring the ability to follow through with commitments and assure support. Sufficient – though not necessarily extensive – funding support can mean the difference between an effective program and one that never gets off the ground.

4. Conclusion and Invitation to Engage

Making connections for sharing the opportunities that space represents relies on both processes and people. The Space Act Agreement is an important mechanism for creating formal relationships with clear responsibilities across borders. The SAA process facilitates how people can interact effectively within a legal framework.

Most importantly, creating a successful outreach program with an international community begins with the commitment of those who are willing to create new relationships that are mutually beneficial while patiently building on one success at a time. By identifying needs and capitalizing on opportunities, by leveraging existing materials and creating new content, by establishing contacts and reaching across agencies and borders, meaningful connections can be made with new communities to carry the message of space, science, and technology.

If you are interested in participating in NASA's Spanish engagement efforts, we encourage you to connect with us through social media: you can find us on Twitter, Instagram and YouTube @NASA_ES.

We also invite you to subscribe to our distribution list where you will receive weekly updates on the latest NASA news in Spanish as well as other relevant opportunities. Visit go.nasa.gov/2Y2tpMM then follow the steps to get on our list. All you need is an email address.

We are interested in hearing your ideas on how we could expand these efforts and extend NASA's science communications in Spanish.

Acknowledgements

Carrie Gilder, Editor
Chris Getteau, Graphics

References

- [1] NASA 2018 Strategic Plan, Strategic Objectives 4.1 Engage in Partnership Strategies and 4.2 Enable Space Access and Services (pp. 32-36) https://www.nasa.gov/sites/default/files/atoms/files/6-nasa_2018_strategic_plan_mar2018_tagged.pdf, (accessed 24.09.19).
- [2] NASA 2018 Strategic Plan, Strategic Objective 2.1 Lay the Foundation for America to Maintain a Constant Human Presence in Low Earth Orbit Enabled by a Commercial Market (pp.17-18) (https://www.nasa.gov/sites/default/files/atoms/files/6-nasa_2018_strategic_plan_mar2018_tagged.pdf, (accessed 24.09.19).
- [3] One World Nations Online, Mexico <https://www.nationsonline.org/oneworld/mexico.htm>, (accessed 24.09.19).
- [4] Hispanics and STEM Education, White House Initiative on Educational Excellence for Hispanics, 2010. <https://sites.ed.gov/hispanic-initiative/files/2014/04/WHIEEH-STEM-Factsheet.pdf>, (accessed 24.09.19).
- [5] National Center of Education Statistics, <https://nces.ed.gov/fastfacts/display.asp?id=96>, (accessed 24.09.19).
- [6] M.T. Khasawneh, R. Bachnak, R. Goonatilake, R. Lin, P. Biswas, S.C. Maldonado, Promoting STEM Education and Careers among Hispanics and Other Minorities through Programs, Enrichment, and Other Activities, #9486, 121st ASEE Annual Conference & Exposition, Indianapolis, IN, 2014, 15-18 June.
- [7] J. M. Bonet et al. El español: una lengua viva, Instituto Cervantes 2017 https://cvc.cervantes.es/lengua/espanol_lengua_viva/pdf/espanol_lengua_viva_2017.pdf, (accessed 24.09.19).
- [8] T. Tinsley, K. Board. Languages for the Future, British Council, 2017. https://www.britishcouncil.org/sites/default/files/languages_for_the_future_2017.pdf, (accessed 24.09.19).
- [9] One World Nations Online, Mexico <https://www.nationsonline.org/oneworld/mexico.htm>, (accessed 24.09.19).
- [10] One World Nations Online, United States of America https://www.nationsonline.org/oneworld/united_states.htm, (accessed 24.09.19).
- [11] W. Booth. Mexico is Now a Top Producer of Engineers, but Where are Jobs? The Washington Post. https://www.washingtonpost.com/world/the_americas/mexico-is-now-a-top-producer-of-engineers-but-where-are-jobs/2012/10/28/902db93a-1e47-11e2-8817-41b9a7aaabc7_story.html, (accessed 24.09.19).
- [12] J. Wade, Mexico is a World Leader in Engineering and Computer Science Grads, 03 Dec. 2015, <http://www.mexico-it.net/mexico-become-world-leader-engineering-computer-science-graduates/>, (accessed 24.09.19).
- [13] Center for Applied Linguistics Directory of Foreign Language Immersion Programs in U.S. Schools, <http://webapp.cal.org/Immersion/Doc/Percentage%20of%20Immersion%20Programs%20by%20Language%20of%20Instruction.pdf>, (accessed 24.09.19).
- [14] Department of Labor, Bureau of Labor Statistics, Employed persons by detailed occupation, sex, race, and Hispanic or Latino ethnicity 2018, 18 January 2019, <https://www.bls.gov/cps/cpsaat11.htm>, (accessed 24.09.19).
- [15] Technolochicas, <https://technolochicas.org/>, (accessed 24.09.19)
- [16] SciGirls Connect, www.pbskids.org/scigirls, (accessed 24.09.19).
- [17] About SciGirls, <https://www.tpt.org/scigirls/about-scigirls-2/>, (accessed 24.09.19).
- [18] NASA Intern and Fellow Opportunities for International Students. <https://www.nasa.gov/stem/international-internships-for-students.html>, (accessed 24.09.19).