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Keywords science education, DEAI, language, Spanish, inclusion

Abstract Multilingualism in museums has long been treated as a supplemental service characterized by the narrow view that translation for exhibit panels and other printed materials is enough. As the worldview of inclusivity and accessibility has evolved, museums have been slow to catch up. This article will examine the challenges and shortfalls impacting multilingual inclusivity in museums, and the impact a lack of inclusivity can have on accessibility for and relationships with visitors. This article will follow the evolution of public programming and inclusivity at Fred Lawrence Whipple Observatory in Amado, Arizona where both physical barriers and societal ones have affected multilingual programming for more than five decades. It will highlight three ways—taking programs to communities that cannot or do not visit the Observatory site, creating programming in Spanish first, and generating cooperative content that highlights native speakers and allows cultural context to overrule translation—in which the Observatory's education and public outreach staff have built programming on a foundation of inclusivity. This article will explain the difference between translations and subtitles as a tool for accessibility, and the development of programs rooted in full inclusivity, where the recognition of cultural context makes all the difference. Finally, this article encourages capacity building and the development of community partnerships to facilitate the creation, growth and long-term maintenance of multilingual programming that not only hears but also amplifies the voice of the community.

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Introduction

Museums affect change by providing society with cues about what matters. Traditionally, museums acted solely as the collectors and protectors of precious history and knowledge, but over time have evolved into places where knowledge expands, wonder is ignited, and social change is highlighted. Despite this significant role, Cecilia Garibay and Steven Yalowitz noted in 2015 that museums continue to struggle with engaging all members of society. Of particular note is the challenge of multilingualism in museum spaces and programming. Garibay and Yalowitz summarized this struggle as being the outcome of too narrow a focus:

> *Most of the questions posed by museum professionals regarding multilingual audiences concern the need for, or the logistics of, providing written resources in multiple languages…The focus on written content…obscures the complexity of linguistic practices within groups, including the social and cultural dimensions of language…language is embedded within the broader socio-cultural contexts in which we participate and our language practices and choices reflect our social relationships and understanding of the world.*[1]

That is to say, language is a part of who we are and how we interact with and learn from our own environments. When cultural organizations fail to recognize and make room for these contexts, the opportunity to deeply connect with and serve visitors is lost. The onset of the COVID-19 pandemic in early 2020 served to further highlight the lack of multilingual diversity and inclusion in museums. By May 2020, roughly 90 percent—some 85,000—of museums around the world had shuttered. Museums, in the US at least, experienced a forced reckoning with long-neglected digitization and digital engagement projects as many patrons quickly adapted to the online lifestyle.[2] However, museums did not immediately incorporate multilingual content into online platforms.

These challenges also affected a small education and public outreach team in Arizona, leading the team to completely rethink inclusivity and language accessibility to better meet the needs of its multilingual audiences. This article provides a case study following the 50-year public engagement journey of Fred Lawrence Whipple Observatory. It examines the Observatory's early efforts after its public dedication in 1968, to its struggle to serve Spanish-speaking families in a post-border patrol checkpoint Arizona. Finally, it highlights the Observatory's current-day commitment to prioritize the Spanish-speaking community as a cornerstone of its education and public outreach program. The Observatory seeks to lay the groundwork for other institutions to make the same commitment to inclusivity, no matter the barriers that may stand in the way.

Fred Lawrence Whipple Observatory: Split Down the Middle

The Fred Lawrence Whipple Observatory is a unique institution, in that it not only carries out major astrophysics research functions as a part of the Smithsonian Institution's partnership with Harvard University (collectively called Center for Astrophysics, Harvard & Smithsonian), but also carries out education and public outreach, the majority of which is targeted at local audiences. Whipple Observatory is located on the county line between Pima County and Santa Cruz County in southern Arizona, challenging education staff to serve the unique needs of two very different local primary audiences. Green Valley, Arizona, just north of

Whipple Observatory in Pima County is home to roughly 21,700 people, a large majority of whom moved to the area in retirement; more than 98 percent of residents are white and nearly 80 percent are over the age of 65. As of 2018, 93.5 percent of residents in Green Valley spoke English as their only language.[3] Santa Cruz County, which is located to the south of the Observatory and borders on the Mexican state of Sonora, exists in stark contrast to Green Valley. With approximately 47,400 residents, Santa Cruz County is home to many young families with small children, and roughly 79 percent of residents speak Spanish, either as their only language or a dual language.[4] While public programming has existed at Whipple Observatory since its dedication in 1968, this programming has by and large served English-speaking audiences. On January 25, 1970, Whipple Observatory launched a public science lecture series in the small Santa Cruz County ranching town of Amado, Arizona.[5] The lecture series persisted and expanded for more than 50 years as an in-person, spoken English series, and is slated for adaptation to a dual-language series in 2022.

Between 1997 and 2010 (when the position was dissolved), a part-time education specialist and his wife provided limited Spanish translation at select events.[6] In 2010, the construction of a border patrol checkpoint just south of Whipple Observatory on Interstate 19, negatively affected connections between the Observatory and the Spanish-speaking community in Santa Cruz County, as it limited, and continues to limit, who can travel unhindered northward in Arizona.[7] Similar checkpoints exist to the west and the east of the Observatory, further limiting connections with rural, Spanish-speaking communities throughout the sparsely populated county.

Between 2010 and 2018, public appetite for astronomy-based science content exploded due to heightened awareness of NASA programs like the Cassini mission to Jupiter and the New Horizons mission to Pluto in the mainstream media. Whipple Observatory's small public outreach team focused resources on onsite tours and capacity building with community partners in the easily accessible Green Valley. In late 2018, under the direction of a new public affairs officer, careful observation of visitors to Whipple Observatory's Visitors Center in Amado, Arizona and records of public requests for collaboration unsurprisingly revealed that relationships with English-speaking audiences had strengthened and expanded over the prior decade while relationships with and services for Spanish-speaking communities had languished. To begin mitigating this exclusion of the Spanish-speaking community, the Whipple Observatory team rewrote its public programming strategy to prioritize Spanish-speaking audiences and families living in Santa Cruz County beginning in 2019. The power of the new strategy came from its foundation. Early on, staff dismissed the idea of bilingualism as accommodation, instead citing Spanish as a foundational requirement to meeting the needs of a community that primarily speaks Spanish. As English-to-Spanish translator Melisa Palferro wrote in 2018, "This approach means a conscious decision to provide total inclusion for a certain community through a completely bilingual presentation, so they will have full access…this shows a willingness to acknowledge and engage audiences on every level."[8] The commitment is significant in both its initial scope and its potential impact.

The biggest challenge with this undertaking was, from the outset, the sheer enormity of such a commitment. With just one staff member and limited funding in education and public

outreach, and a decade of lost connections in the community, the transformation from single language to dual language services would have required decades to achieve.

Realizing that community partnerships could bolster efforts to provide programming and services to Spanish-speaking audiences, staff reached out to NASA's National Informal STEM Education Network (NISE), the NASA/JPL Solar System Ambassadors program, and the Center for Astrophysics, Harvard & Smithsonian's, Latino Initiative Program (LIP) for help. The result is the formation of multiple ongoing collaborations that have already allowed the Observatory to launch Spanish-language specific programming, and that continue to support work toward full and ongoing inclusivity for Spanish-speaking audiences both locally and around the world as the Observatory's audience and education mission expands in the current and post-COVID world.

The core belief of Whipple Observatory's education and public outreach program is that the night sky and its wonders are for everyone, and thereby should be equally accessible to all. The Observatory's programming, *Planetario Viajero del Observatorio Whipple*, *Hablemos de astronomía*, and its latest ongoing effort to leverage a mobile app to put Spanish first in the Science Center, prioritize Spanish and make it not only a translation, but a language from which programs are built.

Planetario Viajero del Observatorio Whipple

Planetariums have sustained popularity in teaching difficult scientific concepts, particularly those in astronomy and space science, due to the sky-like visualization capabilities of a 360-degree planetarium dome. These visualizations, combined with the power of computer simulation, have been shown to increase competency and learning outcomes for complex scientific concepts in children in the K-12 environment.[9] However, not all students have access to a planetarium. In 2008, staff of the Fiske Planetarium in Boulder, Colorado, presented to the annual conference of the Astronomy Society of the Pacific, and wrote that, "Spanish-speaking students have just as much science aptitude and ability as native speakers of English but frequently lack opportunities to obtain and demonstrate their scientific knowledge and skills."[10]

In 2019, Whipple Observatory staff identified this very barrier to access and inclusivity in Santa Cruz County, when it became clear that the nearest full planetarium, the University of Arizona's Flandrau Planetarium, may be inaccessible to Spanish-speaking students and families living "below" the border patrol checkpoint on I-19, and more than an hour away by car. To mitigate this barrier and bridge the gap for students in Santa Cruz County, staff set to work on obtaining a StarLab. StarLab is a mobile planetarium, designed to be set up in schools, parks, and other locations, and is capable of running much of the same content as a full planetarium. While initially staff expected to write multiple grants seeking funds for the mobile planetarium, the stars aligned in late 2019, and staff connected with another science museum in the process of upgrading their own StarLab, and arrangements were made for an in-kind donation of the used StarLab to Whipple Observatory.

Set to launch during school STEM weeks in April 2020, *Planetario Viajero del Observatorio Whipple*, or Whipple Observatory's Traveling Planetarium, was halted by the onset of the

COVID-19 pandemic in Southern Arizona. However, the temporary hold on the program did not stop staff from planning for it to the hit the road someday in the future.

Targeted toward Spanish-speaking classrooms, the mobile planetarium program combines hands-on activities, movie-like dome shows, and live presentations accompanied by space visualizations. Originally meant to be supplemented by the NISE Network's *Explore Science: Earth and Space* learning toolkits, the program was temporarily replaced by NISE Network activities, many of which can be performed virtually with little affect on learning outcomes. When the planetarium program goes back on the road, NISE Network materials will supplement dome shows and astronomy lessons.

Creating *Hablemos de astronomía*

Industry surveys have indicated that Latinx audiences do not feel as though museums and cultural organizations have an interest in engaging them based on the lack of communicationa targeted at Spanish speakers and the Hispanic community. Focus groups conducted by Contemporanea in California in 2015 revealed that "the conspicuous lack of Spanish-language communications at museums stands out…because most other organizations, businesses, and brands they encounter now provide these services…[and] they find it perplexing that museums with public-service missions seem uninterested in reaching and serving Latinos."[11] Those museums and cultural organizations that have created these communication systems and programming have seen long-term success. Dimenna Children's History Museum at the New York Historical Society Museum and Library has offered *Hablemos de la Historia del Arte* (Let's Talk About the History of Art) for more than eight years to Spanish-speaking families with children between the ages of four and ten. In the midst of the pandemic, the Society created a Spanish reading hour online.[12] The Guggenheim in New York City began facilitating conversations on multilingualism in museums nearly a decade ago, and these efforts have had a positive impact on communities throughout the Tri-state area and beyond.[13] Outside of Spanish-specific programming and content, subtitles and translations have often been used as a primary way for museums to support multilingualism in programming and content.[14] However, for science museums, and astronomy centers in particular, subtitles and translations can present hurdles as many words and concepts in astronomy do not have a meaningful translation from English to Spanish, a much larger problem to be tackled by astronomy professionals. The use of subtitles and translations alone no longer represent inclusivity when implemented on their own, as found by Contemporanea.[15] In the case of *Hablemos de astronomía* (Let's Talk About Astronomy), Whipple Observatory wanted to create something that was uniquely for the Spanish-speaking community and focused on teaching astronomy concepts in meaningful and understandable ways.

In July 2020, as staff began planning for the fifty-first year of the Observatory's annual lecture series, it became clear that the flagship program had been massaged over the years to meet the needs of the Green Valley audience. While translations would make the content accessible to Spanish-speaking audiences, it would not meet the level of inclusivity Whipple Observatory aims to achieve. As a result of this realization and the outcome of conversations with the community, staff created a lateral program: a lecture series designed for the Spanish-speaking community, delivered in Spanish. To help design and kick off the program, staff reached out to NASA/JPL Solar System Ambassador, Jaime Cordova, a Latino graduate

student in genetics with a soft spot for astrobiology. Together, Cordova and Whipple Observatory piloted *Hablemos de astronomía* as *La Presentación Espacial* live on YouTube in late 2020 to forty-five viewers in multiple countries with the kickoff topic, *Astrobiología: la búsqueda para vida cercas y lejos*, or Astrobiology: The Search for Life Near and Far.[16]

The program garnered attention from NASA/JPL staff, who assisted in the full launch of the series on January 5, 2021 with NASA James Webb Space Telescope engineer Begoña Vila headlining. Between January 5 and January 29, 2021, the presentation was viewed 678 times by Spanish-speaking audiences around the world, including Spain (14.2%), the United States (6.8%), Mexico (2.8%), and Colombia (2.7%).[17] The series is expected to run live online monthly through the end of 2021.

Leveraging Existing Resources and Platforms to put Spanish first in the Science Center

Inclusion is not simply about providing language as a service; it is also about hearing and amplifying the voice of the community. Contemporanea found in their survey that Spanish language communications are more meaningful when delivered by members of the Hispanic community, but that having staff of Hispanic origin is not enough. They wrote, "Respondents would like to see [Hispanic staff] included in the planning of exhibits and programs, actively contributing a Latino perspective as curators and advisors."[18] To be truly inclusive, museums must actively include the communities they represent in every step of the decision-making process, and of program and content development and execution.

Whipple Observatory received approval in 1987 to construct facilities at base camp, a location at the base of the mountain where the Observatory is located, including a Visitors Center, which opened to the public in 1991.[19] By 2018, few updates had been made to the exhibits, which are presented entirely in English; a former Spanish guide to the exhibits had been lost with time. In 2019, Observatory staff proposed an ambitious update to the exhibits program, which began in late 2020 and is expected to reach completion in 2023. The update, which removes text-heavy information panels to make way for interactive exhibits focused on teaching difficult scientific concepts in novel ways, used the mission of the Smithsonian Science Education Center (SSEC) as a guide: "making K-12 STEM education more accessible and inclusive to diverse audiences across all platforms and communities."[20] To that end, the Science Center, following SSEC's example, has adopted the American Alliance for Museum's Diversity, Equity, Inclusion and Accessibility (DEAI) definitions published in 2019, recognizing the differences and similarities in individuals and groups:

- Diversity is all the ways that people are difference and the same at the individual and group levels.
- Equity is the fair and just treatment of all members of a community.
- Accessibility is giving equitable access to everyone along the continuum of human ability and experience.
- Inclusion refers to the intentional, ongoing effort to ensure that diverse individuals fully participate in all aspects of organizational work, including decision-making processes.[21]

In addition to following guidelines for museums and cultural organizations, the Whipple Observatory adheres to DEAI recommendations for physics professionals. The ever-increasing strength of the DEAI committee at the Center for Astrophysics, Harvard & Smithsonian enables Whipple Observatory's focus on inclusivity for Spanish-speaking audiences to flourish and expand. The Center's support for DEAI allowed staff to gain quick approval for a mobile app to accompany all exhibits and experiences on the Observatory site, including the Science Center, tours, and self-guided walking trails. The app was born of conversations with the community, including an August 2020 survey seeking community input on potential new exhibits and program offerings; of 114 respondents, 87 percent responded positively to the idea of a mobile app to enhance the museum experience.
Currently under development at the time of writing, the final app will be presented in both English and Spanish. Spanish-speaking project collaborators, including graduate students in the Center for Astrophysics' Latino Initiative Program (LIP) and Spanish-speaking members of the community, have the power to create and curate their own supplemental materials, including audio and video. This means more original content in Spanish, rather than only providing content that has been translated or subtitled, delivered by native speakers who fully represent the audience and who inherently understand cultural context. The project further represents an experiment in cooperative content building, with a focus on changing how, and who, decides what is interesting and important in the museum-going experience.

Conclusion

The purpose of this article is to give insight into the processes and current outcomes of designing programs that start from a place of inclusivity. It highlights the public programming challenges faced by Whipple Observatory staff who are working to overcome physical as well as societal barriers to create an inclusive environment for the dominant Spanish-speaking community. The article further focuses on the importance of hearing, involving, and amplifying the voice of the Hispanic community to engender inclusivity as a foundation rather than as an accommodation, and highlight the importance of leaning on community partners for their expertise.

The hope is that the discussion of programmatic execution and community-forward thinking contained herein will inspire other teams to create programming from a place of inclusivity, and graduate from translation as a service to inclusivity as a foundation.

Notes

[1] Cecilia Garibay and Steven Yalowitz, "Redefining Multilingualism in Museums: A Case for Broadening Our Thinking," *A Journal of Reflective Discourse* Vol. 10, no. 1 (April 2015): 3–4, doi.org/10.1179/1559689314Z.00000000028 (accessed January 11, 2021).
[2] United Nations, "Covid-19 Crisis Closes 90 Percent of Museums Globally, UNESCO Plans for Reopenings," *UN News*, May 18, 2020, https://news.un.org/en/story/2020/05/1064362 (accessed, Jan 12, 2021).
[3] U.S. Census Bureau. American Community Survey, 2019, https://data.census.gov/cedsci/table?tid=ACSST5Y2018.S1601&hidePreview=true (accessed Jan 06, 2021).
[4] Ibid.

[5] Donald Hogan, "F.L. Whipple Observatory Event History: The Early Years, 1966–1972," (n.d.): 46, http://www.sao.arizona.edu/FLWO/hist/flwo1966-72.pdf (accessed January 15, 2021).
[6] Oscar Villaseñor was a part-time education specialist for Whipple Obseravtory under the direction of the previous public affairs officer, Dan Brocious, from 1997–2010. When the position was dissolved in 2010, Villaseñor became a science teacher for the Calabasas School in the Santa Cruz Valley Unified School District. Villaseñor reached out to Whipple Observatory in 2018 with the installation of public affairs officer, Amy Oliver, and was instrumental in guiding the early process of bridging gaps between the Observatory and the community in Santa Cruz County. Oscar Villaseñor, text message to author, January 30, 2021.
[7] Amy Lieberman, "Arizona's Checkpoint Rebellion," *Slate*, July 20, 2014, https://slate.com/news-and-politics/2014/07/arizona-immigration-checkpoint-criticism-border-patrol-harasses-people-and-is-a-nuisance.html (accessed Jan 07, 2021).
[8] Melisa Palferro, "Museums in translation: Different Approaches and Levels of Engagement," *LinkedIn*, October 18, 2018, https://www.linkedin.com/pulse/museums-translation-different-approaches-levels-melisa-palferro/ (accessed January 20, 2021).
[9] Sally M. Hobson, Kathy Cabe Trundle and Mesut Saçkes, "Using a Planetarium Software Program to Promote Conceptual Change with Young Children," *Journal of Science Education and Technology*, 19 (April 2010): 165, https://doi.org/10.1007/s10956-009-9189-8 (accessed January 22, 2021).
[10] Suzanne Traub-Metlay, Francisco Salas, and Douglas Duncan, "Muchas Caras: Engaging Spanish Speakers in the Planetarium and K-12 Classroom," *ASP Conference Series*, Vol. 400 (2008): 344, http://adsabs.harvard.edu/pdf/2008ASPC..400..344T (accessed January 22, 2021).
[11] Salvador Acevedo and Monique Madara, "The Latino Experience in Museums: An Exploratory Audience Research Study," San Francisco: Contemporanea (2015): 8-9, http://www.contemporanea.us/wp-content/uploads/2015/04/Latino-Experience-in-Museums-Report-Contemporanea.pdf
(accessed January 17, 2021).
[12] The New-York Historical Society Museum & Library hosts Spanish language events on a weekly basis. Prior to the COVID-19 pandemic, these events were hosted on site at the DiMenna Children's History Museum, and after the building was temporarily shuttered, alternative programming was launched online. The Society does not have a dedicated page for this program, so a past program offering has been used to illustrate the project. Hablemos de la Historia y del Arte: Portraits of Aristocratic Women, New-York Historical Society Museum & Library, November 9, 2013, http://ww.nyhsdev.org/programs/hablemos-de-la-historia-y-del-arte-portraits-aristocratic-women (accessed January 25, 2021).
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[14] Melisa Palferro, 2018.
[15] Salvador Acevedo and Monique Madara, "The Latino Experience," 3.
[16] Analytics data for YouTube projects are available only to the original posting organization. The video of Jaime's presentation has been provided as a reference for the program. Jaime

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[17] Analytics data for YouTube projects are available only to the original posting organization. The video of Dra. Vila's presentation has been provided as a reference for the program. Begoña Vila, "El telescopio especial James Webb," YouTube, January 5, 2021, https://www.youtube.com/watch?v=0wUBqtXi09Y (accessed January 29, 2021).
[18] Salvador Acevedo and Monique Madara, "The Latino Experience," 2.
[19] Donald Hogan, "F.L. Whipple Observatory Event History: The Middle Years, 1987-1990," (n.d.): 61, http://www.sao.arizona.edu/FLWO/hist/flwo1987-90.pdf (accessed January 15, 2021).
[20] Smithsonian Science Education Center, "DEAI in STEM," Last modified October 6, 2020, https://ssec.si.edu/deai-stem (accessed January 1, 2021).
[21] American Alliance of Museums, "Facing Change: Insights from the American Alliance of Museums' Diversity, Equity, Accessiblity, and Inclusion Working Group," 2018, https://www.aam-us.org/wp-content/uploads/2018/04/AAM-DEAI-Working-Group-Full-Report-2018.pdf (accessed January 1, 2021).

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