

Bilingual Exhibit Research Initiative: Institutional and Intergenerational Experiences with Bilingual Exhibitions



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Bilingual Exhibit Research Initiative: Institutional and Intergenerational Experiences with Bilingual Exhibitions

Yalowitz, Garibay, Renner & Plaza (2013)

Executive Summary

The Bilingual Exhibit Research Initiative (BERI) is a National Science Foundation-funded project (NSF DRL#1265662) through the Advancing Informal STEM Learning (AISL) program. This Pathways (planning grant) project was a 3-year project designed to better understand current practices in bilingual exhibitions and Spanish-speaking visitors' uses and perceptions of bilingual exhibitions. Responding to a lack of extensive evaluation or audience research in informal science education (ISE) bilingual interpretation, the Bilingual Exhibit Research Initiative begins to fill a gap in our collective knowledge. While a handful of evaluation studies with bilingual and Spanish-speaking audiences focused on single institutions or exhibitions, BERI explored current practices and visitor engagements across multiple institutions, revealing patterns that exist in a variety of ISE contexts. The BERI team initiated an archive of bilingual exhibition case studies on ExhibitFiles.org, and invited ISE practitioners to contribute additional case studies to support reflective practice and professional dialogue.

The BERI project had a number of research questions that guided the study:

1. What are current practices in bilingual interpretation in informal science education, and what do practitioners know about how these approaches work for bilingual audiences?
2. To what extent do individuals and groups physically engage with the bilingual exhibits? (characterizing both quality and quantity of engagement)? Which bilingual resources do they use, and how do they use them?
3. To what extent do visitors notice and understand the STEM-related content in the exhibits? What role, if any, do the bilingual materials available influence what visitors notice and understand?
4. To what extent do visitors feel comfortable with the content, presentation of information, and overall experience with the exhibits? Do the bilingual materials affect their level of comfort?
5. How and where do members of the group interact with each other as they use the exhibit resources? Are these interactions in Spanish, English, or some combination?
6. To what extent do visitors make personal and/or cultural connections to the exhibition and its content? What role, if any, do the bilingual materials affect perceptions of relevance?

Methods

In order to answer the above research questions, the BERI team conducted 1) a Focused Literature Review, 2) ISE Staff Interviews, and 3) Bilingual Visitor Research. The Focused Literature Review was conducted in order to ground our approach in the literature to the two research methods, and to inform thinking about the working model for the research. The ISE Staff Interviews included telephone interviews paired with a web survey with 32 staff from 22 different ISE institutions that have bilingual exhibits at their institutions. Lastly, the Bilingual Visitor Research component included collecting data from 32 intergenerational Spanish-speaking groups at four different ISE institutions: methods included observations of the groups in a fully bilingual exhibition, followed by a group interview about the experience. Groups were recruited ahead of time, and had to meet the following criteria: the primary language spoken at home was Spanish or both Spanish and English equally (although we expected individuals within a group might have differing language proficiencies), they were intergenerational groups with at least one child between the ages of 7 and 12, and had visited at least 2 museums in the past 2 years

Component	Purpose	Description
Focused Literature Review	To provide a foundation for a grounded theory-based approach to the on-site research, and to inform thinking about the Bilingual Exhibit Experience model.	To inform the BEE model, a focused literature review was conducted in the four main areas: personal identity and behavior, designed museum environment, social norms and interactions, cultural identity and practices.
ISE Staff Interviews	To document current best practices in bilingual English/Spanish interpretation, provide a resource for those considering or creating bilingual interpretation, and inform BERI's Bilingual Visitor Research.	Included interviewing 32 staff from 22 different ISE institutions who have bilingual exhibits at their institution, addressing a variety of topics related to bilingual interpretation.
Bilingual Visitor Research	To study the affordances and factors relevant to bilingual visitor experiences across multiple institutions and regions, in order to further inform the field's approach to bilingual interpretation.	Conducted qualitative research with 32 bilingual intergenerational groups in fully bilingual exhibitions at four science-based institutions; data include observations and audio recording of social and physical interactions with exhibits, and a post-visit open-ended group interview.

Main Findings

The main findings draw on both the ISE Staff Interviews and the Bilingual Visitor Research. Together, these studies reveal a more detailed understanding of institutional practices in bilingual interpretation and the affordances these practices provide intergenerational Spanish-speaking visitor groups. The following are the main findings of the study:

1. Code-switching – The large majority of groups used both Spanish and English during their visit, and the action of switching from one language to another was common in the exhibition. Groups changed between the languages often, even sometimes within the same sentence. In post-visit interviews, bilingual groups said this was a common occurrence for them, especially when they came across a word or phrase in one language that was more easily said or understood in the other language. The groups said switching was relatively effortless and natural for them.
2. Bilingual groups' reading behavior – Some patterns related to reading behavior hold true across both English-only and bilingual groups; specifically, adults read labels more than children. However, bilingual groups also exhibited unique behaviors. Adults were more likely to read in Spanish, while children were more likely to read in English. Individuals also modified the language they spoke depending on the language abilities of who they were at an exhibit with.
3. Access to content – Among the affordances of English/Spanish bilingual interpretation, adults most commonly valued the ability to access content in their preferred language. This was especially true for Spanish-dominant or Spanish-only adults, who said it was easier to learn in their own language or if there were two languages to read. Many used both languages, and some expressed how they compared words between the two languages.
4. Facilitation – The main reason access to content was important to the adults was that it allowed them to fulfill their role as facilitating the experience for the children, since they could read instructions, share information, especially when the children asked what something was or how it worked. This was made even more important given that the children were much less likely to read the labels, either in English or Spanish, than adults.
5. Emotional reactions – The presence of bilingual interpretation had a profound emotional effect on the groups, who do not necessarily expect museums and other ISE institutions to have content bilingually. They said this made them feel more comfortable, enjoy the visit more, and feel more valued by the institution; they often said this changed how they felt about the institution.
6. Learning a language – With bilingual text, quite a few Spanish dominant adults said they tried the English first, then the Spanish to see if they understood it properly; in this manner they were improving their English. Adults also said it was important for their kids to learn or maintain Spanish, and thought having Spanish text helped them do that. They especially valued the ability of their children being bilingual, which was seen as a big advantage.
7. Connection to culture – Groups also saw having bilingual text as an opportunity to connect to one's culture, particularly through language. It was important to adults with fully bilingual,

or English-dominant, that their children be exposed to and continued to speak Spanish, and a museum with bilingual content was a place they could encourage that.

Implications for the Field

Of profound and pervasive significance—almost all visitor groups used both English and Spanish in the exhibitions. And within those groups, language abilities were not uniformly distributed. Complete bilingual text for entire exhibitions enables rich forms of language-based interactions for groups that speak both languages. Providing Spanish text for Spanish-dominant or Spanish-only adults provides more than just access to content—it allowed them to facilitate the visit with their children, provide instructions, keep up with the rest of the group, and feel empowered in the exhibition. Additional positive emotional reactions included feeling welcome, more comfortable, and an affinity with the institutions. Some institutions currently employing extensive bilingual interpretation—and strategies for cultural sensitivity—have seen their audiences respond very favorably, with growing numbers of bilingual and multilingual visitors.

Perhaps of greatest importance, the Bilingual Visitor Research demonstrated that bilingual exhibit experiences were more complex than ISE professionals thought, as reflected in the ISE Staff Interviews. Spanish-speakers don't just access the content in Spanish, they use both languages. Additionally, they don't just access *content*, they participate in the socially-shared experience. The bilingual social groups often engaged in code-switching, going back and forth between English and Spanish when speaking and reading aloud. They did not experience the languages separately. Rather English and Spanish weave together into a linguistically dynamic social experience. Understanding how people actually use bilingual interpretation highlights the value of making the two languages simultaneously available.

The Bilingual Exhibits Research Initiative provides a foundation for future research. Many questions remain about design and content, social interaction, cultural practices and learning. With a focus on bilingual exhibit experiences, continuing research and evaluation can guide informal science education practice toward more beneficial outcomes for bilingual learners.

Acknowledgements

We would like to acknowledge the contributions of the many individuals and institutions who assisted us during the proposal and project phases. First, we wish to acknowledge the contribution that staff at the Explora Science Center made during the proposal phase; in particular, a big thanks to Paul Tatter and Betsy Adamson. They were initially slated to be one of the major partners on the proposal, and they contributed a great deal and challenged the group to think broadly about the purpose and potential impact of the project. We would also like to thank Dr. Bruce MacFadden, the original NSF program officer who oversaw the submission and consideration of the proposal. We also appreciate the feedback we received during the proposal process from the anonymous reviews, both during the pre-proposal and proposal phases – the project is better for their thoughtful commentary. We would also like to thank the two NSF program officers during the BERI project itself: Dr. Monya Ruffin and Dr. Ellen McCallie. Their input, advice and support of the project were invaluable.

There were also a number of individuals and institutions who contributed to our thinking about the project during the conceptualization and carrying out of the project. We would like to officially thank our advisors on the project: Veronica Garcia-Luis of the Exploratorium and Dr. Doris Ash of the University of California, Santa Cruz. Their feedback and critique of our approach and thinking was extremely helpful. Additionally, Laura Huerta Migus spent many phone calls, along with Veronica Garcia-Luis, discussing their project *Multilingual Interpretation in Science Centers and Museums* (Garcia-Luis, McDonald, & Migus, 2011) and how the two projects could help inform each other. Four institutions allowed us to collect research data at their sites for the research project: the San Diego Natural History Museum, the Miami Science Museum, the Children’s Museum of Houston, and the Oregon Museum of Science and Industry. Nineteen institutions participated in the staff interview portion of the project; each of them are listed in that section of the report. Their thoughtful responses to our questions allowed us to not only understand where the field was in terms of bilingual interpretation, but they also helped us rethink some very important components of the research study. Additional colleagues not listed here supported and encouraged us through the project; we are grateful to them as well.

Background

In the United States in 2010, there were more than 50 million Hispanic/Latino residents, or 16% of the total U.S. population. Between 2000 and 2007, the U.S. Hispanic population increased by 29%, about four times the rate of the nation's total population. Additionally, from 2000 to 2050 the Hispanic population was projected to grow from 36 million in 2000 to 103 million in 2050, an increase of 188 percent (U.S. Census, 2004). The United States currently has the world's second-largest Spanish-speaking population (surpassed only by Mexico). According to the U.S. Census Bureau, Spanish is the primary language spoken by 37 million (13%) of people in the United States (U.S. Census, 2011). Furthermore, with the anticipated continued growth of the Latino population in the U.S., it is expected that by 2025, the number of Spanish-speaking Latinos in the United States will reach 40.2 million, an increase from the 27.8 million today (Roslow Research Group, 2005).

While there are currently no nationwide statistics available on Latino visitation to science museums, it is widely acknowledged by the informal science learning field that informal science education institutions do not yet widely engage diverse communities, especially the Hispanic/Latino community. Some U.S. science centers and museums with STEM-related content, such as the Miami Museum of Science and the San Diego Natural History Museum, are actively developing bilingual exhibits in Spanish/English (see Plaza, 2009 for an example). However, there is very little institutional documentation or dissemination of successes and lessons-learned from other museums or projects; some exceptions are Renner (2003a, 2003b) and the NISE Network Translation Process Guide (Jensen, Nunez, Garcia-Luis, Ostman, & Lindgren-Streicher, 2012). More traveling exhibits are beginning to include Spanish to be more marketable and meet the needs of current and future audiences, despite the lack of tested best practices in bilingual exhibit design.

The topic of whether bilingual experiences should be offered can be controversial. Some critics suggest that the general population of the United States should speak and live in an English language environment while others argue that a bi- or multi-lingual society makes for a more positive environment and experiences. On the subject of bilingual education in schools, one can find an abundance of research-based literature about the impact that bilingual environments have on students in a variety of subject areas, including science education (Baker, 2006; Barba, 1993; Doucet & Suárez-Orozco, 2006; Hammond, 2001; Hampton & Rodriguez, 2001; Moses, 2001; Willig, 1985; Winsler, Díaz, Espinosa & Rodriguez, 1999).

Additionally, a study on Hispanic/Latino identity in the United States, released by the Pew Research Center in 2012 (<http://www.pewhispanic.org/2012/04/04/when-labels-dont-fit-hispanics-and-their-views-of-identity/>; Taylor, Lopez, Martínez, & Velasco, 2012), provides valuable contextual information for understanding the challenges, relevance, and potential of bilingual informal science education. This study showed that although often grouped together into the category of Hispanic or Latino, most Latinos did not believe in a single common culture that unites immigrants from Spanish-speaking countries and the descendants of those

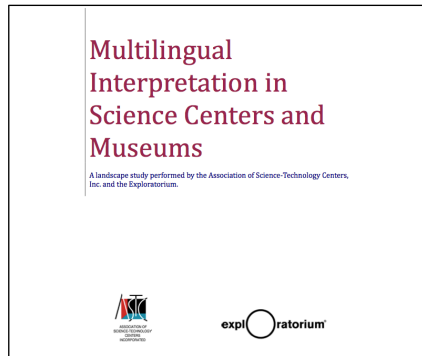
immigrants into a unified group that describes and defines Latinos across these various groups. This sentiment illustrates the heterogeneous nature of the Latino population, with cultural identities stemming principally from their diverse countries of origin. In contrast, many non-Latinos perceive Latinos to be one homogeneous group linked by their use of Spanish language; this type of ingroup/outgroup thinking is very common, and is a matter of perspective informed by one's own experiences. Many Latinos felt strong family and cultural ties to foreign countries, yet also strongly identified themselves as American. In the focused literature review, we briefly address issues of cultural identity, yet we acknowledge the importance of identity as a complex, multi-faceted, and context-dependent phenomenon, influenced only in part by one's spoken language(s).

The Taylor et al. (2012) study also found that most Latinos believed that learning English was important and necessary to succeed in the United States (87%). Many also believed that speaking Spanish was very important (75%) or somewhat important (20%) for future generations of Latinos in the U.S. First generation immigrants (i.e., those born in another country) tended strongly toward Spanish-language dominance; 91% spoke and read Spanish well and 37% spoke and read English well. Second and third generation immigrants tended strongly toward English-language dominance (greater than 90% spoke and read English well). Beyond the first generation, Spanish-language abilities diminish but still persist to some degree, often with self-reported speaking ability exceeding reading ability. For second-generation individuals, 82% spoke Spanish well and 71% read Spanish well. Among those in the third generation, 47% spoke Spanish well and 41% read Spanish well. Although language dominance shifts from Spanish to English with subsequent generations, substantial percentages maintain proficiency in both languages. Among first-generation Latinos, 33% self-identified as bilingual. Among the second generation, 53% were bilingual, while the third generation was 29% bilingual. Language use involves both spoken and written language.

Oral language competence involves receptive skills (listening) and productive skills (speaking); literacy also involves reception (reading) and production (writing) (Baker, 2006). In general, bilingual experiences and exhibits permit opportunities involving multiple modalities, specifically speaking, listening, and reading, and as a consequence, may be a valuable resource for promoting and maintaining bilingual language abilities among individuals and intergenerational social groups. Although unproven, conjecture about the social value of bilingual exhibits—for example, to promote language abilities and access to science learning opportunities—factor into professional discourse and practice.

Some recent research reports on the extent to which science centers and museums are providing these bi- and multi-lingual experiences for their visitors, a topic of particular interest, context and relevance to the current project. The ASTC study is referred to as the Association of Science-Technology Centers' Multilingual Survey (Garcia-Luis, McDonald, & Migus, 2011) and was conducted in collaboration with the Exploratorium in San Francisco, California. It was conducted as an international survey to ascertain the degree to which science centers and museums provide resources with two or more languages for visitors

(http://www.astc.org/resource/equity/Multilingualism%20Report_Final.pdf; Garcia-Luis, McDonald, & Migus, 2011).



Of institutions in the United States who responded (143 individuals representing 111 institutions), approximately 50% reported presenting some form of multilingual information, while 10% offered most or all of their exhibits in more than one language. As expected, English language predominated in U.S. museums and science centers (87%). Among those that provided multilingual resources, Spanish was the most common second language (92%). Exhibit labels comprised the most common multilingual medium (78%); others included marketing materials, public programs, and docents and volunteers. More than half of the U.S. respondents said that an institutional mandate to increase access to exhibits and programs was the primary reason for presenting multilingual information (56%), while targeting underserved audiences was the second most common reason (40%). For many respondents, the availability of financial and staff resources presented the greatest challenge in providing multilingual resources (70%), while the second greatest challenge was creating effective and appropriate translations (33%). The third greatest challenge was cultivating institutional commitment to multilingual resources (25%). Only about one quarter (29%) of the institutions surveyed evaluated any aspect of their multilingual offerings. This joint research by ASTC and the Exploratorium provided valuable information, providing a broad view of the ISE field and its multilingual offerings; while it was a good start many questions remain unanswered, including the extent to which these multilingual offerings made a difference to the visitor experience at many of these institutions.

Current research in the informal learning field indicates the need for bilingual exhibits, as public demand significantly exceeds current supply. Garibay (2006a, 2006b, 2007), for example, identified the need for bilingual interpretation and programs in her research with Latino communities at several cities across the United States (East Coast, Midwest, and West Coast). In her research, both immigrant and second-generation non-museum going Latinos identified a lack of bilingual interpretation as a barrier, noting that it impeded their understanding of exhibit content and for some, also signaled a lack of feeling welcome and included by museums. Other research has confirmed that having bilingual interpretation meets basic needs such as orientation and wayfinding, as well as providing opportunities for more meaningful experiences

in exhibitions (Garcia, 2004; Garibay, 2009b; Yalowitz, Foutz, & Messick Cherry, 2011). A number of visitor studies have included an examination of the potential for bilingual interpretation to positively impact the visitor experience, with the majority of these being documented in unpublished reports (Adams & Renner, 2002; Allen, 2007; Garcia-Luis, 2007; Garibay, 2003, 2004, 2006a, 2007, 2009b; Garibay & Gilmartin, 2003; Renner, 2003c; Yalowitz, 2003; Yalowitz, 2004; Yalowitz, Craig, & Hershorin, 2012; Yalowitz, Foutz, & Messick Cherry, 2011). Many of these studies have focused on the extent to which there is a need for bilingual interpretation as a question of accessing content and information; this makes sense given that interpretation is the most basic means of communicating messages to audiences.

However, beyond the challenges of physical design, the bilingual museum experience must be viewed within a larger socio-cultural context that takes into account the diversity of experiences, preferences and reactions to bilingual interpretation. Emerging research on bilingual interpretation, including many of the studies cited above) is promising and suggests that bilingual interpretation positively impacts Latino visitors' experiences in a variety of ways. It also suggests the possibility of visitor studies and audience research contributing to a much deeper understanding of the bilingual visitor experience, as more than a means of communicating information to individuals.

- Some studies (Garibay, 2009b; Garibay 2004; Garibay & Gilmartin, 2003; Yalowitz, 2003; Yalowitz, Foutz, & Messick Cherry, 2011), have indicated that bilingual labels can support intergenerational groups' interactions by allowing adults, who are typically first-generation Spanish-language dominant, to better understand the content and, in turn, facilitate their (often second-generation bilingual) children's experience.
- Early evidence suggests that presenting content in the visitors' primary language positively affects their understanding of STEM content (Allen, 2007; Yalowitz, Foutz, & Messick Cherry, 2011). For example, results for Allen's (2007) evaluation study of the Secrets of Circles exhibition indicated that visitors whose home language was included in the exhibits' interpretation (English, Spanish, or Vietnamese) were more likely to recognize the main theme of the exhibit. The finding was statistically significant.
- Some studies (Garibay, 2009b; Garibay, 2007; Garibay 2006a, Garibay 2006b; Garibay, 2004) have noted that lack of Spanish-language interpretation is a major factor in Latino non-museum goers' perceptions of feeling unwelcome in museums, and inclusion can increase feeling welcome (Garcia, 2004; Yalowitz, Foutz & Messick Cherry, 2011).

In preparation for this submission of the proposal, the project team conducted a literature search on the topic of bilingual interpretation in the museum field and found very few articles, and while the topic of bilingual interpretation seemed to be gaining momentum lately, the number of studies being conducted in the United States did not seem to be keeping pace. To broaden the search, we contacted science museums in countries like Mexico, Canada and Europe, who frequently provide their content in more than one language, and in some cases are required to have bilingual exhibits (e.g., federally funded exhibits in Canada need to be in both English and French). However, there was very little published or even unpublished work at these

museums related to how bilingual exhibits impact the visitor experience. What little we did find tended to be qualitative, frequently involving focus groups. While this is a valuable method for testing specific exhibitions, programs or museums, it does not provide the field with the kind of generalizable information that is most needed for improving our bilingual approaches.

While the above research indicated that bilingual exhibits can positively impact visitors' experiences, including engagement with and understanding of STEM content, there was a need to conduct additional research to further test these findings and broaden our understanding of the personal, social, cultural, and physical contexts of the bilingual exhibit experience. There was also very little generalizability of the studies since they have almost exclusively dealt with issues specific to a particular institution, exhibit or program. In addition, since almost all of these studies were done at a single institution or in a certain geographic region, it was not known the extent to which museums' Spanish-speaking audiences varied in their response to certain types of experiences. As such, without comparable studies at multiple institutions, we did not yet know if Spanish-speaking audiences varied in their expectations, needs and experiences in science museums. The current study was envisioned to allow an examination of these potential differences, which may or may not affect the visitor experience.

Furthermore, very few institutions currently developing bilingual exhibits have conducted significant amounts of evaluation or research about how Spanish-speaking visitors use or perceive bilingual exhibits, and even fewer have published these findings. There is currently no single source that provides a summary or list of studies relevant to designing and developing effective bilingual experiences in Spanish, and this project hoped to provide a more consolidated source of information on this topic. In addition, there is a need for more systematically designed and rigorously collected body of systematic research to build on what we currently know about bilingual interpretation in Spanish. All of these factors contributed to the idea of conducting a study that would add to the literature in a way that would broaden and deepen the field's understanding of the affordances of bilingual interpretation in science centers and museums.

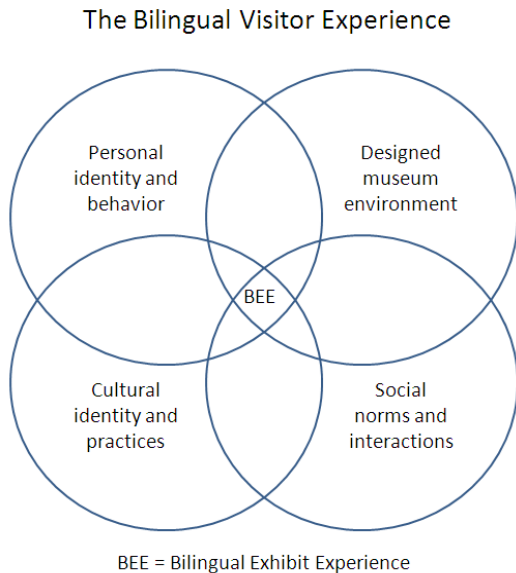
The Bilingual Exhibits Research Initiative (BERI)

As is noted above, the informal science education field needs more systematically designed and rigorously collected research to add to our limited understanding of bilingual Spanish/English exhibits and how they contribute to Spanish-speaking visitors' science museum experiences. The goal of this exploratory Pathways (i.e., planning) grant was to better understand the field's current best practices in bilingual interpretation, and to conduct a qualitative research study that would help inform future work in this area. Given the lack of systematic research in this area, it was determined that qualitative research would be the best approach. The aim of the Bilingual Exhibits Research Initiative was to document and describe how informal science education institutions think about, talk about, and produce bilingual exhibits to gather together the field's collective knowledge, assumptions, and outstanding questions, and to better understand how institutional goals and constraints may ultimately affect visitor experiences

with bilingual exhibits. While a substantial amount of research has investigated bilingual approaches in the formal education arena, very little research has explored bilingual approaches in informal environments such as museums, zoos, and aquariums. We hoped to gain a basic understanding of the extent to which institutions are increasingly offering multilingual experiences (Garcia-Luis, McDonald, & Migus, 2011), and we needed a much more detailed understanding of the production and impacts of bilingual exhibits to further the field.

During the proposal process, it became apparent that we needed a model by which to guide our conversations and decision-making around the project. Since we were not able to find a model in the literature or the field, we created a working model that tried to account (from our perspective) the major factors that might affect the bilingual visitor experience. Our assumption was that this model would more specifically inform the kind of data we collected in the Bilingual Visitor Research, and that we could modify the model as we thought about and studied the bilingual exhibit experience. Figure 1 below conceptualizes the major factors influencing the bilingual experience. The Bilingual Exhibit Experience (BEE) is influenced by social and contextual factors (e.g., by who individual identity, the place they are visiting, the exhibit and greater considerations like cultural practices and considerations, as well as social norms and expectations). We realized that while the designed museum environment is the only factor the exhibit team typically has control over, many museum professionals focus on the designed environment exclusively and fail to consider the implications of design relevant to personal, social, and cultural factors. The BEE model acknowledges that the bilingual experience is truly an intersection between all these factors, and developing this working model influenced our thinking about how to carry out the on-site research component. Better understanding the intersection between the designed bilingual environmental and characteristics and needs of bilingual intergenerational groups would help test and refine the BEE model.

Figure 1. Major factors influencing the bilingual experience:



In order for the model to more greatly inform the on-site research component, it was necessary to identify specific influences within each of the four factor areas. Even though it would likely not be possible to test each of these areas in this exploratory research project, providing the project with a more detailed working model allowed for a more holistic view of the bilingual experience, how the research fit into it and could be useful for any further research undertaken by the team.

- **Personal identity and behavior** factors include an individual’s past experiences, knowledge, attitudes, and beliefs. For example, these might include:
 - Level of knowledge about the specific exhibit content
 - Attitudes towards the content being exhibited
 - Interest and motivation to engage
 - Museum-going behaviors and leisure preferences
- **Designed museum environment** includes the physically designed exhibits (type and size, amount of bilingual interpretation, etc.). For example, these might include
 - Does the content/design invite engagement
 - Does the content/design support social sharing and interaction
 - Does the content/design feel culturally inclusive
- **Social norms and interaction** factors include who someone is visiting with, social norms and expectations, interactions within the group, and interactions with staff/volunteers and other visitors. For example, these might include
 - Who someone is visiting with (e.g., number and composition of group)
 - Social norms – the quality and quantity of interactions within the visiting group
 - How members of the social group make meaning of the experience

- **Cultural identity and practices** factors include such aspects as cultural identity, cultural practices, and language usage patterns. For example, these might include
 - To what degree they feel the institutional culture is inclusive of bilingual Spanish-speaking groups
 - Cultural identity such as level of acculturation and self-defined ethnic identity
 - Language usage patterns such as when and how often they speak Spanish or English in their life

Research Questions – A series of research question were developed to guide the project in its entirety; these focused on best institutional practices as well as a variety of factors related to the bilingual exhibit experience (see Table 1).

Table 1. Research Questions for Bilingual Visitor Research

Research questions to be addressed
1. What are current practices in bilingual interpretation in informal science education, and what do practitioners know about how these approaches work for bilingual audiences?
2. To what extent do individuals and groups physically engage with the bilingual exhibits? (characterizing both quality and quantity of engagement)? Which bilingual resources do they use, and how do they use them?
3. To what extent do visitors notice and understand the STEM-related content in the exhibits? What role, if any, do the bilingual materials available influence what visitors notice and understand?
4. To what extent do visitors feel comfortable with the content, presentation of information, and overall experience with the exhibits? Do the bilingual materials affect their level of comfort?
5. How and where do members of the group interact with each other as they use the exhibit resources? Are these interactions in Spanish, English, or some combination?
6. To what extent do visitors make personal and/or cultural connections to the exhibition and its content? What role, if any, do the bilingual materials affect perceptions of relevance?

Since this was an exploratory project, it was decided that measuring learning fell outside the scope of the current project. Besides the challenge of measuring learning in a valid and reliable manner, and notwithstanding that there are many different kinds of learning (i.e., cognitive, affective, psychomotor, etc.), the content at each of the four institutions included in the study varied. Given all of these challenges, it was decided that while this line of research would at some point likely measure learning, the exploration of the BEE model would be the focus of this particular project.

In order to answer the above research questions, the team determined that the project would include three components (see Table 2). Each component has its own section in the report below that provides further detail about the findings for each one.

Table 2. Project’s Methods and Purpose

Component	Purpose	Description
Focused Literature Review	To provide a grounded theory-based approach to the on-site research, and to inform thinking about the Bilingual Exhibit Experience model.	In order to inform the BEE model, a focused literature review was conducted in the four main areas: personal identity and behavior, designed museum environment, social norms and interactions, cultural identity and practices.
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Bilingual Visitor Research	To study the affordances and factors relevant to bilingual visitor experiences across multiple institutions and regions, in order to further inform the field’s approach to bilingual interpretation.	Conducted qualitative research with 32 bilingual intergenerational groups in a fully bilingual exhibition at four science-based institutions; included observations, audio recording interactions and a group open-ended interview after visiting the exhibition.

Focused Literature Review – For this Pathways Research (planning) project, an exhaustive literature review and write-up was not possible. However, the team wanted the research project to be grounded in the literature, so the main factors included in the Bilingual Exhibit Experience (BEE) model was the focus of the literature review. Each of the four main factors was the focus of its own literature review and write-up below: personal identity and behavior, designed museum environment, social norms and interactions, cultural identity and practices. The findings from the literature review informed thinking about the general approach and individual items for both the ISE Staff Interviews and the Bilingual Visitor Research.

ISE Staff Interviews (n=32 individuals, at 22 institutions) – The staff interviews were included in this study in order to garner a better understanding of how the field was currently, approaching the design and development of bilingual exhibits and exhibitions. For the current project to be truly effective in advancing the field, we needed to know what was currently being done, how it was working and what needs the field identified in the area of understanding the bilingual visitor experience. Additionally, it served to help us identify institutions that could be used as data

collection sites for the Bilingual Visitor Research. The team identified individuals and institutions that had a reputation for doing effective bilingual interpretation and exhibits, and they were contacted by one of the team members about participating in a semi-structured interview (see Appendix A for instrument, Appendix B for web survey responses). Interviews lasted roughly 15 to 30 minutes, depending on the individual and their responses.

On-site Research (n=32 groups, 8 each at 4 institutions) – The main component for this project was a qualitative, exploratory research study conducted on site with bilingual intergenerational groups at multiple institutions. A total of 32 groups were included in the study, at four different institutions: San Diego Natural History Museum, Miami Science Museum, Children’s Museum of Houston, and Oregon Museum of Science and Industry. Each group was recruited ahead of time in order to ensure that they met a number of specific criteria, especially around language use at home. The groups were briefed on the study then visited a fully bilingual exhibition at the institution. During their visit, one member of the group (typically a child) was fitted with a microphone so that their conversations could be recorded; additionally, the researcher recorded the groups’ behaviors on an observation sheet (see Appendix C for on-site research data observation sheet). After they finished the visit to the exhibition, the group was interviewed about their experiences in the bilingual exhibition and other relevant factors (see Appendix D for on-site research interview form).

The vision of the research team was to plan a cohesive research program, the first steps of which occurred in this Pathways Research project and the next steps being a full Research proposal, in order to provide new exhibit development resources to the field of informal science education. These resources will be based on a scientific understanding of the interaction between visitors and various aspects of bilingual exhibits. Before the full-scale research project could be proposed, we felt that there was some basic exploratory, framework- and model-building work that needed to occur before a more comprehensive study could be conducted. In fact, we had originally intended to submit a full Research proposal until we realized that for both ourselves and the field, there is a need for more documentation of existing practices and a solid research-based framework put forward for bilingual interpretation. Ultimately, we hope to enhance communication and collaboration among those who design and develop bilingual museum exhibits in Spanish and English. This Pathways project is a first step in creating a comprehensive research-based framework for developing effective bilingual experiences for Spanish-speaking visitors, which can be tested in future research. The remaining report focuses on summarizing the results of the three main deliverables: 1) ISE Staff Interviews, 2) Focused Literature Review, and 3) the Bilingual Visitor Research.

Focused Literature Review

As mentioned previously, the focused literature review's primary purpose was to inform the project team's thinking about the two research methods: ISE Staff Interviews and Bilingual Visitor Research. Given that we had already come up with a model (the Bilingual Exhibit Experience, or BEE for short), we focused our literature review on the main factors that were included in the study – see below.

Executive Summary of Focused Literature Review

The project created a model (see Figure 1 above) that identified the major contributors to the Bilingual Exhibit Experience (BEE) as four major areas: Personal Identify and Behavior, Designed Museum Environment, Cultural Identity and Practices, and Social Norms and Interactions. It was hypothesized that these factors would be major contributors to what the bilingual exhibit experience was like for Spanish-speaking groups.

While in reviewing the literature we could not identify particular areas of scholarly research that lined up with the categories above, we did identify four areas in the literature that would be particularly useful for thinking about the research study. These areas included the following:

- 1) Culture's Role in Bilingual Individuals
- 2) Identity and Bilingualism
- 3) Research and Evaluation on Bilingual Interpretation in Museums
- 4) Teaching Science Bilingually

The first two areas of the focused literature review related directly to the factors in the BEE model of "Cultural identity and practice" and "Personal identity and behavior," since we realized that it would be tough to tease apart personal and cultural identity, especially when bilingualism has both personal and cultural considerations. Meaning, one's personal identity often includes cultural identity, and often multiple cultural identities; therefore, the literature review focused on the intersection of personal and cultural identity rather than splitting them into two separate literature reviews. Meanwhile, Bilingual Interpretation in Museums related directly to the BEE model factor of "Designed museum environment," as this was essential looking in the literature for what the field knows about how visitors react to and utilize bilingual exhibits. While the focused literature review did not map directly to the BEE model factors of "Social norms and interactions," the social experience is so embedded within the other three factors of the BEE model that it was expected that the focused literature review would still reveal interesting information about the role of social experiences in the four focused literature review areas. It should be noted that when we looked at bilingualism and identity, because of the project's focus on intergenerational groups in museums, we focused very specifically on children and bilingual education. Thus, there is likely a body of literature on bilingual identity, education, and adults that we did not focus on.

The goal of the literature review was that looking at the combination four areas above would reveal valuable information about where to focus our energies in the on-site research, thus grounding our approach in theories from multiple fields. To adequately research the four literature areas listed above, we did indeed have to look to different fields, although it should be noted that there are other articles and published materials in these areas that could apply – the literature review for this Pathways project was very focused and purposeful rather than exhaustive. Even so, we thought including it in this report would be useful to the field.

Culture’s Role in Bilingual Individuals

What is culture?

Researchers and educators define culture in a variety of ways, but a recurring theme that cuts across disciplines revolves around culture as a socially shared set of practices. We will look at various construal of culture found in the literature that may open up avenues or erect barriers to expanding access to informal science education for Latinos.

Culture as a Set of Valuable Resources

Sometimes we talk about culture as a way to separate ourselves from others, to distinguish “us” from “them.” The anthropologist Franz Boas spoke of culture with a positive spin as “the genius of a people.” The *Funds of Knowledge* ethnographic research project involved teachers, diverse students and their families, and established from the beginning that visits to students’ homes and communities should be perceived primarily in terms of the “strengths and resources that they possess” (González, Moll, & Amanti, 2005). All research team members—anthropologists, psychologists, educators—identified themselves as learners. They devoted themselves to learning about their students’ lived experience, discovering various forms of expertise in the family and community, and finding ways to value and recruit the children’s practices of everyday thinking for learning activities in the classroom. For example, the students and family members use mathematics and geometry in carpentry, masonry, and sewing. Many children have bilingual skills, and routinely navigate complex social interactions that involve switching between languages (code-switching) and translating. Others know about commerce, economics, and social customs in two countries (U.S. and Mexico). Teachers explored how they could draw on the children’s experience to make academic content relevant and accessible to their students.

Language as a Powerful Tool

Language and complex culture distinguish humans from other animals. We use language to organize and coordinate activity, to share and internalize knowledge and practices (Vygotsky, 1978). Educators can intentionally use language in various ways (i.e., discursive practices) to give structure to inquiry, dialogue, and learning how to think like a scientist. Drawing on experts’ discursive practices, Heath (2007) offers some examples:

- Hypotheticals of possibility and probability;

- Comparative or analytical critiques;
- Future scenario narratives;
- Extended explication with temporal and causal dimensions;
- Step-by-step run-throughs of accumulated data or accomplished steps in a process.

In non-classroom inquiry environments, such as laboratories and studios, Heath (2007) has also found other varieties of discourse that include taking up different roles, meta-cognitive expressions (in particular, awareness of not knowing something, identification of self as learner, with not knowing compelling the learner to further inquiry), discussion of process and outcomes, density of vocabulary, sentence-structure variation, and intensive use of declaratives and interrogatives (Ibid). The initiation-response-evaluation (IRE) form, in which the teacher typically asks a question (often with a known answer), the student responds, and the teacher evaluates the response, is the most common discursive practice in the classroom setting (Mehan, 1979). Outside of the classroom in laboratories and studios, the IRE form is rare (Heath, 2007).

Despite characterizations of science as transcending culture, the process of generating scientific knowledge in the Western tradition constitutes a set of cultural practices with attendant values and beliefs (Aikenhead, 2006). The culture of science and the many scientific disciplines involve specialized language and forms of notation (Lemke, 1990). This specialized language can limit access to scientific concepts, and consequently influence an individual's self-assessment of scientific ability (Cobern & Aikenhead, 1998). Detailed analysis of students' speech in science classrooms reveals the simultaneous negotiation of dual discourse streams, that of scientific content and management of social relations (Lemke, 1990). In these science learning settings, understanding can be "talked into being" (Ibid).

Access to Science Involves Moving Between Worlds

To enter the world of science requires learning the language and practices of this unique culture. Aikenhead (1996, 2006) describes this process as border crossing, (i.e., moving from everyday thinking, speaking, and doing to using the specialized language, symbols, and tools of scientific disciplines). The difficulty of moving between worlds of everyday practices and scientific practices varies depending on prior exposure to Western science and culture. The border crossing may be congruent or smooth, resulting in assimilation. It may be more hazardous to one's identity, with the potential result of acculturation. If the student finds crossing the border to be impossible, resistance may result. Based on their experience with science education, Cobern and Aikenhead (1998) characterize students as "Potential Scientist," "Other Smart Kids," "I Don't Know' Students," and "Outsiders." This categorization scheme conveys implications related to identity, affect, and social relations – that science is not only affected by culture, but can also be defined by it.

Although we might tend to idealize the scientific process as rational, linear, and refined, inquiries into scientific practice in action reveal an "intricate intertwining of the conceptual, imaginative, material, discursive, symbolic, emotional, and experiential" (Nasir, Rosebery,

Warren & Lee, 2006 citing Biagioli, 1999; Galison, 1997). These authors propose expanding our notions about scientific thinking and activity—based on observation— to include use of embodied imagination, argumentation, and metaphor for purposes of theorizing and knowledge-building (Nasir, et al., 2006). A careful look at science as practiced by scientists suggests possible links with everyday ways of thinking.

Creating Mediating Structures

Through interaction—with objects and especially other people—we learn ways of thinking, doing, being, and making meaning. These interactions, characterized as cultural mediation, drive development and learning, which are acknowledged as inherently social processes (Cole, 1995). Humans create structures, or scaffolding, to help bridge the gap between what is known and unknown in order to facilitate learning. Learning researchers (Nasir, et al., 2006) outline the role of scaffolding in developing adaptive expertise:

1. address basic needs for safety and belonging
2. make structure of the domain visible
3. show possible trajectories to competence
4. provide timely, flexible feedback

The *Cultural Modeling* framework for the design of learning environments offers ways to leverage everyday knowledge and practices for academic, discipline-based learning (Lee, 1995, 2003). Consistent with the *Funds of Knowledge* philosophy, *Cultural Modeling* takes advantage of everyday practices to serve as valuable resources on which to build new learning. Appropriate scaffolding can highlight the relevant structure of the everyday practices and the disciplinary content, and mediate between the two.

Pitfalls to Avoid

In our collective efforts to address the needs of any audience, particularly the underserved, we must take care not to overlook the complexity and heterogeneity of culture. Economy of effort and efficiency of communication may lead to short cuts in which we homogenize the diversity of related groups (González, Moll, & Amanti, 2005). For example, a tremendous variety of life experience, cultural heritage, and language expertise can be found in the group labeled “Latino.” Limited knowledge of Latinos may lead to a prototype model of “Latino” that anchors a category “Latino,” and in the process, assumes an essence of what “Latino” means. To essentialize, or typologize, Latinos denies the richness of many loosely related cultural groups. Recognizing that a one-dimensional view of the Latino audience, and how they may relate to science, would be a limiting factor in this research study.

Identity and Bilingualism

What is identity?

The following is an introduction and summary of identity and its various components from Kelly (2007, p.6), that can be considered when thinking about cultural identity and bilingualism: “A person’s identity is how they see themselves in relation to their world and their role within it. Identity is fluid, shaped by the social context and membership of a community and changes across a person’s life cycle (Kidd, 2002; Vander Zanden, & Pace, 1984; Wenger, 1998). It includes a range of factors such as age, gender, cultural background, socioeconomic status as well as general life experiences (Fienberg & Leinhardt, 2002). Identity is an integral part of a person’s personality and how others perceive them (Paris, Byrnes & Paris, 2001). Identity not only influences who a person is now, but also how they behave and conceive of themselves in the future. Identity assists individuals to “... cope with new situations in terms of ... past experiences [while providing] tools to plan for the future.” (Sfard & Prusak, 2005, p.16). The most relevant pieces for this study related to the fact that cultural identity is certainly a function of its social context and can also be thought of as changing over time; this maybe particularly related to immigrants who may assimilate to certain cultural norms in a new country.

Identity Formation in Latino Adolescents

The challenges of identity formation in adolescence can be compounded by the additional stress that results from such factors as immigration and settlement in an unfamiliar country. While it is already challenging being an adolescent, Suárez-Orozco (2000) points out that there are an additional set of complex challenges for those who immigrate to another country. They further talk about the fact that these children have to live and function in multiple worlds, which in turn complicates and impacts their identity formation. These immigrant children may feel the pull of various groups: parents, and both peers of their culture of origin and also in their newly adopted country. However, researchers point to three possible outcomes with respect to identity formation in Latino adolescents that are helpful in conceptualizing the subject (Suárez-Orozco & Suárez Orozco, 2007). These outcomes are usually framed in terms of the interrelated effects of racialization, segmentation, discrimination, social mirroring, poverty, and exclusion from the opportunity structure.

For example, from Suárez -Orozco (2000): “In our work with immigrant children (Suárez-Orozco & Suárez-Orozco, 1995) we have noted that youth attempting to traverse discontinuous cultural, political, and economic spaces tended to gravitate towards one of three dominant styles of adaptation which we have termed **ethnic flight, adversarial, and bicultural**. A single child, depending upon age at migration, race, and socio-economic background, legal status, and very importantly, the context of resettlement in the United States, may first gravitate to one style of adaptation. As she matures and develops and as her contexts change, she may develop another style of adaptation. We did not see these styles as fixed or mutually exclusive. We hypothesized that contexts, opportunities,

networks, and social mirroring act as powerful gravitational fields shaping the adaptation of immigrant children.” These reactions can include assimilation, or identifying with American culture. Another group may react in an adversarial manner towards the mainstream American culture. Other people may learn to become bicultural and live comfortably in both worlds. There are many reasons why immigrant children may gravitate towards one of these three groups, including family, peers, the specific community they live in, and the extent to which more mainstream opportunities are available to them. The bicultural approach may end up being the group that would be most likely to engage in bilingual activities and benefit by having bilingual exhibitions, since they are the ones most likely to be comfortable with both languages and the idea of switching back and forth.

Bilingual Education and Identity

There is research showing the advantage of dual-language programs, which are able to both increase English-speaking proficiency, maintain cultural ties to language and help maintain cultural identity. Research indicates that Spanish American children and adolescents can learn English better and adjust more comfortably to America if their ties with the Spanish-speaking world are kept alive and active from infancy on (Lambert, 1973). And yet, research has long established the positive outcomes of dual-language programs that stress academic success and safeguard cultural identity. There is also evidence that in an experimental study bilingual children relative to a monolingual control group show definitive advantages on measures of “cognitive flexibility,” “creativity,” or “divergent thought” (Gándara, 2002). There are also models, like the “language as resource” model (Ruiz, 1984) that look to build on, rather than replace, first languages in the classroom. These models focus more on transitioning, or scaffolding, where the assumption is that you’re not starting out at a zero point; this not only acknowledges but utilizes students’ current abilities. As By valuing the non-English language in the curriculum, such programs give the language—and its speakers—greater prestige, thus simultaneously addressing issues of intergroup relations (Suárez-Orozco & Pérez, 2002, p.341). There is a growing literature that focuses on the affordances of bilingual educations and the number of and the enthusiasm towards bilingual schools, especially in the important elementary school years, is a testament to changing attitudes towards bilingual education. The purpose of this section is not to provide an exhaustive, or even deep, summary of the literature, simply to acknowledge that there is a growing body of work supporting the idea that taking advantage of students’ bilingualism benefits them greatly. While there has not been as much research in the intersection between bilingual education and identity, one can see that maintaining and utilizing one’s native language in school would certainly have an impact on one’s perceived identity. The exact nature of this relationship should be studied more fully.

Museums, Identity, and Learning

The research literature reveals a general consensus regarding the ability of museums to impact visitor identity. Kelly (2007) notes “Researchers have speculated that the museum experience influences identity. It has been recognized that museums can play a crucial role in shaping both individual and national identities through their collections, research and public programs (Gurian, 1999; Rounds, 2006; Weil, 1997)” (p.46). Furthermore, Kelly (2007) talks about how a

museum's objects can also contribute to a visitor's identity: "Museums also have objects which can strongly resonate with a person's experience, contributing to both forming and affirming a visitor's identity (Gurian, 1999; Ivanova, 2003; Leinhardt, Crowley, & Knutson, 2002; Paris, 2002)" (p.47)." Much of the research on identity has focused on the implications for the museum being able to contribute to visitors' thinking of and perception of identity; however, less research has been done on the extent to which the intersection of the designed experience and culture impacts both the visitor experience and culture.

Therefore, it follows that having a bilingual experience may contribute an even greater impact on a visitor's cultural identity if having interpretation in one's native language provides a greater degree of cultural access. Kelly (2007, p.49) also provides another assertion that relates to this study: "Hooper-Greenhill (2004) identified a range of learning outcomes that could be expected from students visiting museums which related to identity, including '...the development of a more complex view of self, family, neighborhood, or personal world' (p.164). She recognized that attitudes towards the self and others could also be changed as a result of a museum visit. In reporting on her work with school students and teachers, Hooper-Greenhill (2004a) concluded that children exhibited more positive *learning identities* after visiting a museum, particularly when they engaged in active learning experiences, were able to handle objects and were provided with opportunities to talk to experts." This has obvious application to the idea that museums can play a role in not only helping form identities around the specific topics covered in the museum exhibitions, but that positive experiences around accessing the information bilingually could impact cultural identity as well. Language providing a key mechanism for accessing content, while also reinforcing culture, could reinforce the idea of the importance of culture in informal learning experiences. Kelly (2007, p.51) sums it up nicely by saying "The literature revealed that learning is a creative process of change in a person's identity—from not knowing to knowing, or being able to do something that hasn't been done before. In a broader sense learning could also lead to some major change within an individual's identity—in their perceptions, attitudes, behavior, or the way they see themselves, others, and their world."

Research and Evaluation on Bilingual Interpretation in Museums

While the interest about the impact of bilingual interpretation in museums has grown as the Spanish-speaking population in the U.S. has grown, there are few studies that have focused on the effect of bilingual interpretation on visitors. Most of the studies that do exist have been as part of evaluation of specific exhibits or programs. Rarely have these evaluations focused solely on bilingual interpretation. Rather, a question about bilingual interpretation has been included in a larger evaluation study. Nonetheless, the evaluations and research studies that do exist offer some interesting findings about the effect of bilingual interpretation.

General Attitudes about Making Bilingual Interpretation Available in Museums

One question museum professionals often pose is what visitors' attitudes are about bilingual interpretation. A number of studies indicate that museum visitors—regardless of their ethnic background or language preference—generally feel positively about the inclusion of bilingual (or

multilingual) interpretation in museums. The primary reasons, from visitors' perspectives, for the inclusion of bilingual interpretation include: a) it meets the needs of a growing demographic, b) it makes content accessible to Spanish-speakers; c) it signals that a museum welcomes diverse visitors and is an inclusive place.

Allen's (2007) *Secrets of Circles* summative evaluation found that almost 62% of respondents felt positively about the inclusion of trilingual labels (English, Spanish, Vietnamese) in the exhibition. Another 30% had either a neutral or mildly positive response and 3% had a negative response; 6% did not notice the trilingual labels. When asked if they would recommend that the museum create labels only in English or in other languages, the vast majority (86%) said they would recommend that the museum include multilingual labels.

In a study at the Palm Springs Art Museum (Garibay, 2009b), a random sample of visitors were surveyed about having the Museum incorporate both English and Spanish interpretive labels into the exhibits. 76% responded positively to the idea, 17% were neutral, and 8% responded negatively. Those respondents who felt that including bilingual labels was a positive step cited three main reasons: a) as a response to demographic changes; b) as a way to expand museum audiences, and c) in order to become more accessible to the community. Garibay also found some differences in attitudes based on age. Generally, younger visitors tended to be slightly more positive toward the inclusion of bilingual labels and negative responses almost doubled among the oldest cohort of respondents (65+) of whom 15% felt interpretation should be English-only.

A study by Yalowitz, Craig, & Hershon (2012) also asked general visitors to the Smithsonian Institution's National Museum of Natural History, in the Chilean Miner's exhibition, about their reactions to the bilingual nature of the exhibition. Both Spanish- and English-speakers rated the exhibition highly, although Spanish-speakers rated it slightly higher. When asked why the exhibition was bilingual, the two most common responses were that it could be more inclusive (35%) and because it was about Chile (32%). Not only was the general audience not affected in a negative by the exhibition (only 1% said it detracted from their experience), but many said it actually enhanced their experience (39%). Meanwhile, 60% said it didn't make a difference to them. However, when asked if future exhibitions should be in Spanish, 42% said yes, 13% said no, and 44% said it depends on the context of the exhibition.

How do Visitors use Bilingual Interpretation?

The question of whether non-English dominant visitors actually use bilingual interpretation has been explored. However, few studies have actually asked this question, although responses to questions about bilingual interpretation with Spanish-speaking visitors in most studies suggests they do. One such study at the Monterey Bay Aquarium did seek to quantify use; Yalowitz found that over three-quarters of Spanish-speaking visitors surveyed (84%) said they already had or planned on using at least one of the Spanish-speaking opportunities available. In another study Garibay (2009b) found that although only 38% of respondents reported speaking Spanish at

home all or most of the time, more than half (58%) reported using both the Spanish and English labels.

There is some evidence that bilingual interpretation can enhance social interaction and the learning within intergenerational groups. For example, some studies (Garibay, 2004; Garibay & Gilmartin, 2003; Yalowitz, 2003; Yalowitz, Craig, & Hershorin, 2012) found that English/Spanish interpretation in exhibits allowed adults who were less English proficient to read the labels and then discuss the content with their children, often helping parents focus their children's attention and increasing the groups' overall engagement with a particular unit or experience. In a study at the Palm Spring Art Museum Garibay (2009b) compared visitor interactions at a small art exhibition under two conditions: fully bilingual labels and a partial-translation version where only the main panels were available in both languages. Those respondents who were Spanish-dominant tended to share and talk about label information with others more often in the fully bilingual version than those visiting the partial-translation version of the exhibition. There were no differences between the two groups, however, in total time spent at the exhibit.

Ash (2004) used bilingual mediators to assist Spanish-speaking families for studies conducted at the Monterey Bay Aquarium when she found that visitors were unable to use the English-only interpretation to engage further in exhibit content. She found that families not only used a range of resources to engage with and make sense of content (e.g., prior experiences, photos, artifacts/objects, the facilitator) but also engaged in code-switching where they used both Spanish and English in their inquiry. Ash notes that, "Because they all wanted information in their own language, the dialogic pace was fast, bilingual, and overlapping. The two older children used both languages and they seemed to know when to switch from one language to the other to get the interpreter's attention" (Ash, 2004, p.878-879).

On the programmatic end, Wheaton and Ash (2008) found that Latino girls who participated in informal science programs offered in Spanish and English felt welcome, increased their confidence, and allowed participants to more readily share information about the program with their parents.

Does Bilingual Interpretation Affect Visitor Outcomes?

Inclusion: Provision of exhibit information in multiple languages may lead to bilingual visitors feeling more welcomed and included in the museum's exhibits and overall mission; consequently, they may have more positive attitudes toward exhibits, the museum, and/or science in general. In 2003, Exploratorium researchers surveyed Chinese and Latino non-museum goers about leisure activities and perceptions of the Exploratorium and museums in general (Garcia-Luis, 2007). Both communities identified five ways the museum could improve, including making them feel welcome and respected, providing culturally relevant exhibits and programs, having bilingual staff and multilingual materials, advertising offerings in their communities, and providing reduced admission for large family groups. Similarly, studies in three widely-separated U.S. cities, Garibay (2007, 2006a, 2006b) found evidence suggesting that providing multilingual interpretation in informal learning contexts could be an effective way of

reaching non-museum going Latino audiences. In this work, an absence of bilingual information was seen as a barrier to engagement by both immigrant and second-generation Latinos. For some, the lack of Spanish text interfered with their understanding of exhibit content; for others, it created a feeling of being excluded (Garcia, 2004).

Access/Knowledge: Multilingual exhibit labels may lead to bilingual visitors being better able to use the exhibits, leading to improvements in exhibit engagement; in turn, this enhanced exhibit engagement may lead to improvements in understanding of underlying STEM content. Allen's (2007) summative evaluation of Children's Discovery Museum's *Secrets of Circles* exhibition provided evidence of Vietnamese visitors reading the Vietnamese text to understand the exhibit, reading it aloud to help another person, reading both English and Vietnamese versions to understand the exhibit, practicing language skills, and checking translation accuracy. Moreover, whereas 91% of adult visitors whose home language was represented in exhibit labels correctly identified the exhibition's underlying theme, only 62% of visitors with unrepresented home languages did so (Allen, 2007). In fact, results suggested that home language may be a stronger influence on adult learners' understanding of content than either gender or visit repetition.

These findings have parallels in more formal educational settings; for example, Solano-Flores, Lara, Sexton, & Navarrete (2001) showed that English-only presentation of tests in science and math may result in poorer performance by students whose native language is other than English; and work by Banks (2007) and Ballenger (2008) suggests that learning is facilitated when learners are encouraged to use both primary and secondary languages. More broadly, Carpentier, Mauricio, Gonzales, Millsap, Meza, Dumka, German, & Genalo, (2007) found that maintaining a recognition of cultural variables in developing school-based health programs enhanced student engagement in those programs.

Cultural Appropriateness: Multilingual labels may allow bilingual visitors to experience exhibits and the museum within culturally familiar family frameworks and practices. Research on "language brokering" suggests that immigrant parents must often rely on their children for information about objects and events (Halgunseth, 2003). However, such situations may conflict with traditional family roles in which parents provide information to their children (citation here). It is unclear how such conflicts might affect exhibit engagement or discussion of underlying concepts. More broadly, sociological research suggests that science centers have the potential to affect parent-child interactions focusing on everyday science. A UC Santa Cruz study, for example, indicated that when Mexican-Americans talk about science to their children, they include more explanations and exploratory questions if the parent has visited a museum (Tenenbaum & Callanan, 2008). Garibay, in fact, has argued that bilingual interpretation can increase comfort and empower parents by providing caretakers with tools to engage and support their children's learning (Garibay, 2004; Garibay, 2009a; Garibay, 2009b). In one study at the Monterey Bay Aquarium, visitors were asked a question about other educational settings they had visited and whether they felt comfortable there as Spanish-speakers. Of those that

responded positively, the most popular reasons cited for why they felt comfortable was the availability of signs in Spanish and the presence of Spanish-speaking staff or guides (Ash, 2004).

Teaching Science Bilingually

The idea of bilingual classrooms in the United States has been a controversial topic for many years, and the first state to adopt a bilingual education law was Ohio in 1839, for German-English instruction. In 1968 the United States passed the Bilingual Education Act (see http://en.wikipedia.org/wiki/Bilingual_Education_Act), mandating that immigrants have access to formal education in their “first” language. Since 1968, a variety of different approaches have been used in different states and schools, to varying degrees of success. With this increase in bilingual education, there have been many studies conducted about the effectiveness of bilingual education. A number of these studies have focused on bilingual science education, and this section highlights some of the main findings and implications for the Bilingual Exhibits Research Initiative (BERI).

One meta-analysis focused on the effectiveness of bilingual education (Willig, 1985) in general, reviewing quantitative studies that looked at a variety of outcomes, including reading, language skills, mathematics, social studies and writing, among others. Willig found that participation in bilingual education showed differential gains based on whether the outcomes were looked at in English or Spanish. Gains in English were found for tests of reading, language skills, mathematics and total achievement. Gains in the non-English language were found for reading, language, mathematics, writing, social studies, listening comprehension, and attitudes towards school and self. So while there seemed to be more gains for the “second” language, there were gains for learning in English as well. Additionally, effect sizes (or the magnitude of the influence) were lower when the programs had unstable or hostile environment. This could have implications for the perceived attitude of the environment or its leaders towards the inclusion of the second language – if there are negative or hostile bilingual environments, this will likely affect students’ abilities to learn. Willig mentioned the methodological inadequacies in many of the studies that prevented definitive conclusions from being made about bilingual education in general, and called for more sound methodological studies of bilingual education.

Barbar (1993) conducted a needs-assessment of the use of culturally-relevant material in bilingual classrooms, and determined that while the science classrooms were presenting information bilingually, they were not doing so in a culturally appropriate and relevant manner for the students. For example, the classes tended not to use the child’s native languages, incorporate hands-on materials, or include families or peers in the learning process. Lastly, there were few culturally appropriate role models, examples, analogies and elaborations in the instruction (Barba, 1993). Barba saw a lot of room for improvement in making the bilingual classroom experience more useful and relevant to the learners; just the inclusion of another language was not enough. This could have implications for museums’ approaches to bilingual interpretation because simply translating the text into Spanish, without any cultural reference points, may result in less than ideal results.

Specific Approaches to Bilingual Education

Involving parents and the community: In the Hispanic/Latino community, the family group and larger community are an important influence on many different aspects of a child's life. An example of how this can be incorporated into education has been examined by Hammond (2001), who looked at the degree to which parents and community members can work with elementary school teachers and students to come up with a more community-based model for science education. This qualitative study showed how one community included building garden houses to complement and supplement the science curriculum. Hammond talked about how the approach drew on participants' funds of knowledge, made the material more culturally relevant and meaningful for students, and more accessible and responsive to school standards. Again, the inclusion of community or culturally relevant approaches seemed to be effective when dealing with bilingual education.

Focusing on groups rather than individuals: The past few decades have seen an increase in using a group approach to learning science, and there has been a movement from groups of students simply doing activities together in a group, to groups of students working cohesively and collaboratively to understand concepts and figure out problems. One recent case study (Radinsky, Oliva, & Alamar, 2010) focused on understanding the social nature of science learning in a 6th grade classroom, studying how a group of students navigated the social experience of understanding and explaining seasonal variations in daylight hours. The study focused on the concepts of collective practices, distributed cognition and emergent understandings, and how peers referenced and talked about each others' ideas. They go on to talk about the positive qualities of this approach and its implications for rethinking teaching science in the classroom.

Inquiry-based approaches: One study looked at how using an inquiry-based approach improved bilingual third graders' ability to classify and communicate orally about science topics (Rodriguez & Bethel, 1983). In this study an experimental design compared those who were in a classroom that used an inquiry approach in science lessons with manipulation of objects, peer interaction and teacher-pupil interaction compared to a control group. This combination yielded a significant difference for the experimental group's classification and oral communication skills, suggesting that the multi-faceted inquiry-based approach did make a difference in science abilities.

Advantages to Bilingual Approaches

Classification and Description: As mentioned previously, Rodriguez and Bethel (1983) found that inquiry-based approaches that used a combination of hands-on activities with additional interactions with peers and teachers positively impacted students' abilities to classify and talk about content. So beyond looking just at the language aspect of bilingual education, using multiple strategies within the bilingual approach can have a positive impact. Of particular note is the combination of what students did (manipulation) supported by interactions with peers and teachers.

Increases in both languages: Another study (Winsler, Díaz, Espinosa, & Rodríguez, 1999) examined how Mexican-American children were impacted by being in a bilingual pre-school; a control group was included for children who stayed at home and did not attend pre-school. The study found that not only was there no loss in Spanish proficiency for those in the bilingual pre-school, but those who attended the bilingual pre-school also showed gains in both Spanish- and English-language proficiency and development. The authors looked at language in multiple areas: productive language, receptive language, and language complexity. Another study conducted by Hampton and Rodriguez (2001) showed that bilingual elementary school classrooms in Texas showed that language skills increased in both languages, and there was little difference in science concepts understood by both Spanish- and English-speaking children. These two studies are important reminders that sometimes there are unexpected results, and that learning something in two languages may provide affordances that learning in one may not.

ISE Staff Interviews

Informal science education professionals face many decisions: Should their institution provide any text in Spanish? If so, what might they hope to accomplish? How should they create and then present bilingual text most effectively? Is text translation enough to serve Spanish-speaking and bilingual visitors, or should other approaches be considered? Very few research-based resources exist to help professionals make decisions related to bilingual exhibits. Critical questions in the field have not yet been answered: How do Spanish-speaking visitors use bilingual text to make sense of their museum experience? What issues—in addition to language—should practitioners attend to so that Spanish-speaking visitors derive the greatest learning benefits? The purpose of the ISE Staff Interviews was to gather information about best practices and the state of the field in bilingual interpretation approaches, and also to determine what questions the field has in order to inform the Bilingual Visitor Research. To this end, the research study could be as useful as possible to the field.

Methods

To answer questions focused on current professional approaches to bilingual exhibits, the Bilingual Exhibits Research Initiative (BERI) team collected data from 32 staff from 22 informal science education (ISE) institutions in the United States, using a combination of a web-based survey and telephone interviews. We documented and analyzed responses related to the following issues:

- How did these museums and science centers make the decision to provide bilingual interpretation for visitors, and what is the institution's philosophy and commitment to bilingual interpretation?
- What form do bilingual exhibits take? What media are used? What content is presented in bilingual formats?
- How do ISE professionals create bilingual exhibits; i.e., what typical practices and processes do they engage in?
- Who is the audience for bilingual exhibits? What are ISE professionals' observations, questions, and hypotheses about how visitors use bilingual exhibits?
- How do ISE professionals perceive the challenges, opportunities, constraints, benefits, and consequences related to bilingual interpretation?

The research team sought ISE institutions with exhibits in English and Spanish to participate in the study. We generated a list of interviewees drawing on the project team's personal and institutional networks and contacts (e.g. the National Association of Museum Exhibition, the Association of Science-Technology Centers, and the NSF-sponsored Self Reliance Foundation 2009 conference *Expanding Informal Science Education for Latinos* as well as an Internet search of U.S. science-based institutions that offer bilingual exhibitions. Participating institutions represented geographic diversity throughout the United States (northeast, southeast, midwest, west, northwest, southwest), institutional/content diversity (science centers, natural history

museums, nature centers, children’s museums, a zoo, and an aquarium), percentage of bilingual exhibits currently on view, and depth of experience presenting bilingual exhibits. Individual participants included a variety of institutional roles (director, curator, manager of exhibits, vice president, graphic designer, educator, researcher/evaluator). In some cases, more than one person at an institution was interviewed, in order to capture multiple perspectives within the institution; it was thought that if only educators, or exhibits staff, or senior staff were interviewed then this had the potential to skew the findings.

The following is a list of participating institutions in the research study:

- Arizona Sonoran Desert Museum, Tucson, AZ
- Austin Children's Museum, Austin, TX
- Birch Aquarium at the Scripps Institution of Oceanography, San Diego, CA
- Boston Children's Museum, Boston, MA
- California Science Center, Los Angeles, CA
- Denver Museum of Nature and Science, Denver, CO
- Explora, Albuquerque, NM
- Exploratorium, San Francisco, CA
- Fort Worth Museum of Science and History, Fort Worth, TX
- The Field Museum, Chicago, IL
- Houston Children's Museum
- Long Island Children's Museum, Garden City, NY
- Miami Museum of Science, Miami, FL
- Monterey Bay Aquarium, Monterey, CA
- The New York Botanical Garden, Bronx, NY
- Newark Museum, Newark, NJ
- Oregon Museum of Science & Industry, Portland, OR
- Peabody Essex Museum, Salem, MA
- Reuben H. Fleet Science Center, San Diego, CA
- San Diego Natural History Museum, San Diego, CA
- San Jose Children’s Discovery Museum, San Jose, CA
- Zoo Miami, Miami, FL

Participants received an email from the research team with a link to an initial web-based survey and a request for an interview. In addition to the 22 participating institutions, we contacted staff members at an additional four institutions who ultimately did not participate in the study due to schedule constraints; therefore the 22 out of the 26 institutions responding was an 85% response rate. The web-based survey asked nine questions designed to determine the scope and duration of their institution’s bilingual exhibit efforts: how long their institution has presented bilingual exhibits, what percentage of temporary and permanent exhibitions are bilingual, and how many bilingual exhibits they have personally worked on (Appendix B includes the web survey questions and quantitative results).

The telephone interviews involved a naturalistic conversational protocol (Lincoln & Guba, 1985), that included a more open-ended interview that could capture interesting themes and topics as they occurred. A naturalistic interview includes questions that guide the interview, and the interviewer responds to the participant with appropriate modifications and follow-up questions, adapting as the conversation progresses to facilitate mutual understanding, build trust, and acquire meaningful data. The BERI interview questions focused on the following topics:

- institutional philosophy/commitment to bilingual exhibits formalized in a strategic plan
- how the institution initiated their bilingual exhibit efforts
- does a particular person champion the cause
- how support for the bilingual effort is distributed throughout the institution
- how they currently create bilingual exhibits
- who participates in the process
- what they have learned from their experience
- the greatest challenges and opportunities in bilingual interpretation
- expectations, observations, hypotheses about visitor interactions with bilingual exhibits

Two participants responded to questions in face-to-face interviews, while the remaining interviews were conducted by telephone. The research team took notes and audio-recorded all interviews for the purpose of analysis.

The research team documented responses to each question and conducted a thematic analysis, using themes established with the interview questions in advance and themes that emerged in the interview responses. Themes inherent in the questions established before conducting the interviews focused on audience, exhibits, interactions among visitors and exhibits, and institutional philosophy and practices. Themes that emerged from the interviews related to professionals' knowledge of internal and external demographics, awareness of cultural and linguistic diversity, concerns about information delivery mechanisms, how institutions engage with diverse cultural groups, and how individuals and organizations learn about visitors. Since many themes emerged spontaneously in the interviews, some results reported below represent ideas volunteered by study participants, not specifically asked about by interviewers. A qualitative analysis resulted in the categorization of results by theme. By counting the frequency of occurrence of these themes, we gained a sense of the magnitude or prevalence of a particular theme, which in some cases were introduced by participants.

BERI Staff Interviews: Findings

Through interviews with informal science education professionals, there were different levels of experience, knowledge, and questions about bilingual exhibits. There were patterns and variations in how professionals talked about their audiences, their exhibits, and the bilingual exhibit experience itself—that is, how the audience and exhibits intersected. Institutions also varied in the amount of bilingual interpretation in their exhibits. The range and patterns of their responses can be broken down into the following categories:

- Reaching and serving Spanish-speaking audiences:
 - Who is the bilingual audience? How do we recognize them?
- Producing bilingual exhibits:
 - Process—How do they create bilingual exhibits?
 - Product—What is the form and content?
- Intersection of audience, bilingual exhibits and institutional practices:
 - What is the nature of visitor interactions with bilingual exhibits?
 - What is the rationale and purpose of bilingual exhibits?
- Bilingual exhibit costs and benefits, mission and economics

Interview questions addressed the extent to which the institutions think about and attempt to meet the needs of their bilingual audiences. They also focused on not only the bilingual exhibits themselves, but also the process by which the institutions develop the exhibits. Another important aspect was to ask the ISE professionals about the intersection of audiences, exhibits and institutional practices: meaning, how do these factors figure into the visitor experience for bilingual or Spanish-speaking visitors. Additionally, it was important to find out how the staff perceived the costs and benefits of bilingual exhibitions, and how they related to meeting the institutions' missions and financial needs. Interviewees' responses related to these themes, with trends that reflected their professional concerns.

Reaching and Serving Spanish-speaking Audiences

Many staff from ISE institutions (15 out of 22) spoke of the demographic gap between the audience they currently serve and the diverse multicultural composition of the communities in which they reside. This acknowledgement implicitly addresses the difference between current and potential audiences, since they did not see their current visitors as representative of the communities they seek to serve. For many (15 out of 22), this gap between demographics inside and outside the institution did play a part in motivating their decision to implement bilingual interpretation. Most respondents mentioned that creating bilingual exhibits presents the opportunity to better serve their communities, to welcome diverse audience members, and to increase access to their institution's offerings—findings that were consistent with the ASTC/Exploratorium 2011 survey mentioned earlier (Garcia-Luis, McDonald, & Migus, 2011). One interview respondent from a children's museum said, *"For us, multilingual exhibits aren't just a way to make the content available. It demonstrates that the Museum is for them."* Another professional stated that *"Language is a signifier of welcome."*

When staff members speak of the general public, they recognize that Spanish-speaking audiences are not homogeneous but actually quite diverse. For example, immigrant populations reflect patterns of immigration that are related to history and geography. In the West and Southwest of the United States, the majority of Latinos have a Mexican or Mexican-American heritage. In the Southeast, specifically in Miami, Cuban-Americans predominate, while several other Caribbean and Latin American communities also have a presence there. With cultural diversity comes linguistic diversity, and most staff (18 out of 22) showed an awareness of

regional differences in the Spanish language, as reflected in the comments, *“There are many flavors of Spanish”* and *“In the past, translations were too contentious because of different Spanish variations or dialects. We decided it’s best to use a certified translator... They understand the local language and proper Spanish; they know the right words and phrases that are appropriate to this market.”*

Staff at many institutions (14 out of 22) recognized that bilingual individuals vary in their comfort and language proficiency with reading and speaking in English and Spanish. Many (14 out of 22) also recognized generational patterns in language use; for example, first-generation immigrants tend toward Spanish dominance and second-generation immigrants tend toward English dominance (Taylor, Lopez, Martínez, & Velasco, 2012). Based on the above-mentioned generational differences in language fluency, professionals (14 out of 22) expressed their interest in bilingual exhibits’ capacity to promote intergenerational engagement and learning, in addition to other social benefits. *“Bilingual interpretation promotes intergenerational conversations between family members. For example, a child may speak conversational Spanish but may not be familiar with many words. A grandmother may speak English, but she rarely reads it. Based on our observations, we’ve seen that family members will read interpretation together. When successful, these interactions elicit a sense of inclusion and cultural validation, in addition to familial bonding.”*

Some institutions (7 out of 22) have used formal visitor research or regular staff interactions with visitors to better understand their current audience. Evaluation of bilingual exhibits remains limited, with the exception of a few institutions (6 out of 22). *“We don’t know who uses the bilingual text and how it is making sense.”* Some (9 out of 22) have dedicated staff to facilitate community outreach, develop ongoing relationships with target communities, and coordinate special programs such as Family Science Nights. Those who don’t currently engage in visitor research or learning through programmatic interaction with Latino audiences often lamented the fact, saying they wish they had the financial resources to acquire more information about their current and potential visitors. Some (7 out of 22) made reference to relevant literature in the field, for example, when citing the various barriers to Latinos’ attendance that go beyond language issues and may include cost, proximity and transportation, interest, and a lack of feeling welcomed or that they belong. As one respondent articulated, *“Bilingual interpretation is part of our effort to seem less forbidding to people who did not have access or felt precluded from museums in their country of origin because of socio-economic status.”* In some cases, it is difficult to separate socio-economic status from the bilingual issue; this goes back to the generational issue raised earlier where the most recent a person had immigrated the more likely they were to be Spanish-dominant or Spanish-only ((Taylor, Lopez, Martínez, & Velasco, 2012).

Producing Bilingual Exhibits: Process and Product

In discussions about their multilingual exhibit approaches, all respondents addressed the presence of two languages, and a few (2 out of 22) present three languages; note that the sample we were trying to reach were only those institutions that were producing at least

bilingual exhibits. To varying degrees, most respondents (17 out of 22) recognized that Spanish language may be necessary but not sufficient to make the content accessible. Practitioners often recognized in addition to providing exhibits in Spanish, other factors—related to social norms, family needs, cultural practices, preferences, and interests—likely play a role, even if they cannot specify exactly how these factors interact. *“Our goal is to become inclusive, to become everyone’s museum. Translating exhibits is not a magic bullet. We’re taking a comprehensive look at staffing, food in the cafeteria, changing our website, etc.”* Even so, among institutions that provided multilingual resources, all used exhibits as the most common medium for serving bilingual audiences’ needs.



The San Diego Natural History Museum’s core exhibits include text in English and Spanish.

In all cases discussed (22 out of 22), staff members developed exhibit content in English first, then translated text into Spanish; since these interviews were conducted there seems to be a trend among a small number of institutions to develop the content in parallel track for English and Spanish, rather than producing text in one language and translated it into the other. One respondent noted that *“we are not to the co-development stage yet,”* suggesting that in an idealized institutional trajectory, English-language and Spanish-language exhibit developers would work in tandem to develop content. Within a basically linear process, some staff

members mentioned feedback loops whereby the translation process compelled refinement of the English text. *“(Having bilingual text) generally improves the English in terms of its requirements for efficient use of graphic space, or lengths of audio content.”* One respondent said that all their exhibits resulted from an intensely iterative process, with ongoing visitor observations and continuous possibility for design changes.

Many of the institutions (16 out of 22) used translators on a contract basis to produce bilingual exhibits. Some emphasized different factors to consider when finding a translator: the need for certification, use of “middle-ground dialect” or international Spanish (sometimes referred to as Univisión Spanish, after the Spanish-language television network viewed in many Spanish-language countries), sensitivity to regionalisms, and challenges with specialized scientific language. In these cases, other Spanish-speaking staff members often review the text for content accuracy, conceptual coherence, and appropriateness of voice. Some respondents specifically expressed concern about the fidelity of their Spanish language interpretation. Those that work with translation contractors said their in-house staff have to revise the Spanish text to properly align the translation with the original meaning expressed in English, with the inaccuracies in translation sometimes relating to conceptual content. Staff noted the challenge of finding reviewers with two essential qualities: content expertise and Spanish-language competence. Misalignment between English and Spanish sometimes related to use of colloquialisms and dialect. Almost all of the respondents sought to reflect the regional voice of their majority Latino constituency. Although many wanted maximum accessibility and correctness with a “middle-ground dialect,” translators who used the more generalized “international Spanish” sometimes failed to express the desired regional voice. In contrast with the ASTC/Exploratorium multilingual study, we found that only in some cases (6 out of 22) did in-house staff members translate English text into Spanish, a task they accomplished in addition to their other regular duties. The majority (16 out of 22) contracted external consultants for translation or development of Spanish text. It should be noted that since the interviewers were conducted the NISE Network Translation Process Guide (Jensen, Nunez, Garcia-Luis, Ostman, & Lindgren-Streicher, 2012) has come out, which provides resources for translating information into Spanish: http://www.nisenet.org/catalog/tools_guides/translation_process_guide.

Half of the study’s participants (11 out of 22) wondered how much Spanish translation is enough, saying things like *“It’s hard to accommodate bilingual text due to space and budget. Is [absence of Spanish text] a deal-breaker for visitors?”* This is a common refrain for those either already producing bilingual exhibits or those seriously considering it. One individual explicitly expressed the opinion that the need for parity between English and Spanish is a fallacy, based on input from an expert advisor. However, others (9 out of 22) expressed a goal to faithfully translate all the text into Spanish to provide full access to the science content for Spanish-speakers and to impart a sense of respect and belonging. One respondent maintained that this sense of social inclusion is fully conveyed only when Spanish language interpretation has the same visual presence, in terms of label and font size, as its English language counterpart. One shunned the use of audio tours in multiple languages as a viable mode of delivering Spanish-language content because *“the people who make up 40% of your community should have more*

[visual representation] than those two French people who happened to stop by.”

About half said their goal in presenting bilingual content was or should be equal treatment of English and Spanish text. These practitioners expressed concern about and interest in the most effective ways of presenting two languages, both in terms of the placement of text and images in traditional labels, and the possibility of using other modes of interpretation such as brochures, audio tours, smart phones, and digital technologies. *“The greatest challenge is how to do it. We’re not in favor of duplicate text on the wall; that’s the easy way. We don’t want a wall of text. It’s hard enough to reduce the amount of text. There should be a digital solution, but we don’t know what that is.”* Technology often comes up in conversations about how to present text or content in multiple languages, since there is frequently a sensitivity about creating a visually crowded environment.

Assumptions and practices varied regarding which text to translate, and how much Spanish text will satisfy visitors’ needs (i.e., how much is “enough”). In fact, the field has very little data and analysis to support or reject these assumptions, often operating strictly on individual preferences and/or opinions. Institutions with many bilingual exhibits (76-100% bilingual exhibits) tended to proceed with an institutional commitment, sometimes in the form of a formal mandate. Among institutions with few bilingual exhibits (0-25% bilingual exhibits), staff often expressed a desire for more information, purportedly so that they could make strategic decisions about how to maximize impact with bilingual visitors for their investment in bilingual exhibits. There did seem to be, if not a continuum, at least a path of increasing dedication to bilingual exhibits; though, not every institution proceeded along that path at the same speed or in the same manner.

Collectively, science center and museum staff has a real desire for documentation of evidence-based best practices, a resource that currently does not exist in the public domain. Most respondents (18 out of 22) expressed concern about limiting the amount of content to avoid overwhelming their visitors with “a wall of words.” *“In our initial approach, we did double text. But people don’t read if it’s double text. They find it mentally daunting.”* Most (19 out of 22) expected that technology could help practitioners solve dilemmas related to “visual and mental overload” that some feel accompany the simultaneous presentation of two or more languages. Concerns about allocation of space weighed heavily on practitioners, as most of the staff we talked to (18 out of 22) worried about the consequences of adding a second language. *“Bilingual text takes more space. We don’t want to overwhelm visitors with too much text. And we can’t translate everything, because we just don’t have enough space.”*

A few practitioners (5 out of 22) welcomed the challenge to reduce the number of words on their bilingual labels as an opportunity to provide more concise, clear, and direct messages, but even so competing priorities and tensions remain. One respondent from an institution with minimal bilingual resources said, *“There’s a reluctance to cut back on text...but maybe we rely too much on text,”* suggesting that *“People don’t come to museums to read. They come to be active, to do things.”* Another respondent from an institution with complete bilingual text said,

“less language is better.” They intended the exhibit text to encourage exploration, rather than to be instructive. In their institutional practices, they emphasize facilitation and learning through social interaction and spoken language, in contrast to a large investment in providing text on printed labels. Others (10 out of 22) expressed the desire to find other avenues of content delivery, such as brochures, audio tours, smart phones, and digital technologies, that did not require any substantial editing and reworking of the original English content. There was a realization that they were heavily dependent upon text, but there may be alternatives that could complement whatever text-based bilingual approaches they were or could be using.

Some institutions provided bilingual interpretation for exhibition content they believed would be of special interest to Latino audiences. Staff at some institutions with limited bilingual interpretation said they translated exhibits based on their perceived potential attraction to Latinos (e.g., they involve a Spanish-speaking artist, curator, geographical location, or special topic). This approach assumes that specific content drives interest among Spanish-speaking audiences, without mention of other possible motivations such as spending time with friends and family or visiting a cultural attraction. This same belief has also been found to occur in studies with visitors about which exhibits to translate into Spanish (Yalowitz, Craig, & Hershorin, 2012).

Particularly among children’s museums, multiple languages themselves were perceived to serve as content, not just a method of delivering content. All of the children’s museums surveyed (5 out of 5) had a mission to expose children to various forms of human diversity, and in this context the simple presence of multiple languages could catalyze conversation between adults and children about how people speak different languages. *“English speakers appreciate other languages too. They use them for learning opportunities, that other people speak different languages, and exploring the meanings of words.”*

Intersection of Audience, Bilingual Exhibits, and Institutional Practices

Although everyone interviewed expressed their intentions to serve a culturally diverse audience, respondents varied in their degree of having an in-depth understanding of Latino audiences. Many (16 out of 22) recognized that Spanish language not only provides access to informational content, but it also potentially signifies that the institution welcomes Spanish-speakers. One institution provides classes for staff with conversational Spanish language infused with Mexican culture. Some (12 out of 22) expressed the awareness that Latinos’ needs may not be served by the institution’s current practices regarding a wide range of issues that go beyond bilingual signage, including visiting hours, family membership policies, food service, public communication, and learning opportunities for social groups.

The social composition of ISE organizations—from leadership, to operational staff, to the audiences they currently serve—represent the cultural, linguistic, and socioeconomic diversity of the larger population to varying degrees. Some organizations (10 out of 22) make explicit efforts to achieve a culturally diverse composition of their staff and board, to be more

representative of, and by extension more responsive to their diverse communities. Some directly confront changing demographics with professional development for staff related to cultural diversity and inclusion, culturally relevant visitor studies, and experimenting with new exhibit approaches and community engagement. It should not be surprising that institutions with a known track record of providing quality bilingual exhibits are making these efforts, although in many cases they go well beyond simply providing bilingual exhibits.

Some respondents (10 out of 22) said they experienced strong agreement from staff towards their institution's approach to bilingual exhibits. We found the greatest expression of alignment among institutions with an explicit commitment to bilingual interpretation: *"We have a policy—everything needs to be bilingual."* A staff member from one institution described the commitment to bilingual interpretation as happening throughout the institution, despite minimal bilingual resources at the present time. Institutions where staff reported divergent perspectives, or disagreement, among staff on bilingual interpretation (related to worthiness, priority, or necessity) tended to have very limited bilingual resources. Among institutions with more than one staff member interviewed, we found variance in emphasis on concerns, yet similarity in perception of institutional commitment. Meaning, that the more committed an institution was to bilingual interpretation, the more cohesive they were in their attitudes towards offering these experiences. Whether they were more committed because they were doing it, or whether they were doing it because they were more committed is unclear; at this point it is a "chicken/egg" type of question that is difficult to answer.

The institutions that have formalized their commitment to bilingual interpretation in a strategic plan or as policy (14 out of 22) demonstrated more depth in their awareness of the frequently complex social, cultural, and language issues relevant to bilingual audiences. Among those, some (9 out of 14) devoted resources to organizational learning about visitors and actively engaged with diverse cultural groups through a variety of means. *"Our multicultural events engage staff in learning and we have professional development opportunities around language and culture...This has been amazing learning for our staff. We see increases in cultural competence. We've learned to think more broadly and to engage diverse groups."* They tended to talk about the multifaceted nature of bilingualism, visitors' feelings of inclusion and exclusion, and opportunities for varied social interaction. They also acknowledged logistical challenges and dilemmas inherent in creating bilingual or multilingual exhibits.

Staff at institutions that have not yet formalized their commitment to bilingual interpretation, and/or that provide minimal multilingual resources, tended more often to express concern about limitations of exhibit space and budget money, and finding the appropriate information delivery mechanism for bilingual interpretation. They tended not to have an institutional practice of learning about visitors through visitor studies or outreach, and they tended to talk less about the social consequences of bilingual exhibits. Whether a more formal commitment would change this, or whether the attitudes need to change to achieve a more formal commitment, remains to be seen.

In order to both increase our understanding of what work needs to be done in bilingual interpretation, as well as to inform the on-site research component of this project, we asked staff what questions they had about how audiences think about and engage with bilingual interpretation. The staff from all 22 informal science education (ISE) institutions in this study were able to articulate questions that they would like answers to, including some which we had neither been aware of nor had considered prior to the interviews. Although the participating institutions varied in how much they were currently investing in organizational learning, it was heartening that all these groups were curious about what works with regards to bilingual exhibits. Again, all of the institutions in this part of the study had done at least one bilingual exhibit, so maybe this should not be all that surprising. Many respondents specifically asked about best practices, although when asked, none were able to cite examples of best practices.

Common questions by ISE professionals about bilingual exhibits included the following:

- Can the institutional decision to make bilingual exhibits emanate from a cost-benefit analysis?
- How much Spanish text is enough?
- How do bilingual exhibits affect visitor engagement with science content?
- How do multigenerational groups use bilingual interpretation?
- Does bilingual text create visual and/or mental overload?
- Does bilingual text make Spanish-speakers feel more comfortable in museums?
- What is the most effective delivery mechanism for bilingual or multilingual text?
(Two respondents explicitly mentioned that the best solutions may depend on context; i.e. who is the audience, what is the content, how it is designed, and where is it located.)
- Do bilingual exhibits drive attendance and learning? (A few staff members in the West and Southwest asked: Is bilingual text a preference or a necessity for Latino visitors?)

One respondent said *“We’re curious to get visitors’ perspective on labels, interpretation and format. We want to learn more about how multilingual labels are used in social settings. Are they used like English-only labels? In multilingual families, someone often serves as the interpreter for the group. People play different roles. What happens when no one in the group has to serve as the interpreter and everyone can access the information? I would expect a greater level of participation. More people can access the content, they can experience it more directly, experience it together.”* This particular individual shows an understanding of the complexity and context-dependent role that bilingual experiences for Spanish-speaking groups.

Whether or not exhibits provide all text in English and Spanish, ISE professionals’ over-arching and most basic unanswered questions related to *1) who uses bilingual exhibits, and 2) how do they use them?*

Bilingual Exhibit Costs and Benefits, Mission and Economics

Professionals’ questions and concerns tended to cluster into two general categories: bilingual exhibits as an institutional economic transaction (bottom-line concerns) and bilingual exhibits as a visitor-centered social transaction (mission-related). All respondents discussed economic

concerns related to staff capacity, financial budgets, and exhibition real estate, with varying emphases on these areas. Some made reference to tough economic times and staff reductions adding to the difficulty of providing extra resources to produce bilingual text. At one institution that created exhibits for rent, the staff respondent said that market forces and demand from clients compelled them to create bilingual interpretation for their traveling exhibits. Another respondent said that, although they value bilingual text in their rented temporary exhibits, they don't routinely allocate financial resources for bilingual interpretation when they produce their own exhibits. So the reasons for doing bilingual text as well as their attitudes towards it varied.

Every single respondent spoke of bilingual interpretation as service to the community, and commented on the social and learning benefits for visitors. Yet institutional practices reflected varying degrees of engagement in understanding diverse audiences and the efforts necessary to be inclusive. Generally speaking, staff position correlated highly with the kinds of concerns they talked about, in relation to bilingual exhibits. Oftentimes, while staff members in exhibit departments talked more about the logistics, challenges, and costs in time, money, and exhibition space related to creating bilingual exhibits, this did not exclude discussion of audience and mission. Staff members in leadership and administrative positions spoke more about audience and mission, while expressing some awareness of the logistical concerns exhibits staff tended to focus on. These two primary emphases illustrate how ISE professionals continuously balance the benefits they provide their communities with the institutional costs associated with their community service, often through a filter based on their day-to-day responsibilities at their institution.

Representatives from most ISE institutions (16 out of 22) implicitly or explicitly expressed the hypothesis that bilingual interpretation promotes engagement and science learning among Latinos—in fact, this was often stated as the primary motivation for their investment of resources in producing bilingual exhibits. Consistent with the dearth of research on the subject, our respondents knew very little about how bilingual interpretation promoted engagement and learning. This topic, however, was the primary motivation for the Bilingual Exhibits Research Initiative (BERI) project, which includes studies with visitors to ISE settings in addition to research on current professional practices. The results of BERI's on-site research investigates how bilingual exhibits affect engagement with science, technology, engineering, and mathematics in informal settings, offering valuable information relevant to practice.

In general, the institutions with more active efforts to produce bilingual exhibits also invested more resources in learning about visitors, and staff members from those institutions expressed greater knowledge of the actual or possible consequences of engagement with bilingual exhibits. Yet even these institutions expressed that there was still much more to learn. One respondent stated, *"Even though we've been doing it (bilingual interpretation) for ten years, I think we are still in diapers, we're still so fresh."*

Despite the awareness that they lack information about the efficacy of bilingual interpretation, most of the institutions that have formalized their commitment to bilingual interpretation in a

strategic plan (11 out of 14) have yet to engage in systematic evaluation of their bilingual exhibits. The reasons given include lack of resources and the perception that such evaluations are unnecessary. Some said they do not have the personnel or resources to conduct visitor studies and exhibit evaluations, in order to further engage the community. One respondent confessed an unwillingness to evaluate bilingual exhibits because the results might compromise a hard fought campaign to establish bilingual interpretation as a regular and necessary part of exhibit development at her institution. Despite a desire for more detailed information about how visitors use bilingual exhibits, few institutions have committed resources to investigating this issue for themselves.

Not surprisingly, since we were talking to practitioners, there was a very practical focus during the discussions, as no one talked about the larger social issues relating informal science education efforts to underrepresentation of Latinos in science, technology, engineering, and mathematics (STEM) disciplines, a current concern among many in formal and informal education (Gándara, 2009). To effectively study the relationship between participation in informal science education and long-term engagement with the STEM disciplines requires great commitment of research resources that many institutions simply do not have. In addition, longitudinal studies with research designs well suited to exploring questions regarding long-term effects of informal science learning typically exceed the duration of research grants (often 2 to 4 years long).

Many staff members (14 out of 22) expressed concerns about competing priorities and strategic use of resources such as exhibit space, money, and staff time; this is also not surprising given the pressure that many institutions are under to produce more, with less. All staff interviewed wanted to serve visitors, but most (18 out of 22) didn't know even basic questions such as who their general visitors were, what they wanted, or what they needed. Some said that visitors don't go to museums to read labels, but also expressed a reluctance to reduce the amount of English text to make space available for Spanish text. Some wanted a way to calculate the relative costs and benefits of bilingual interpretation for their visitors—if only they could know the potential impact of bilingual exhibits, then they could decide whether or not to invest the resources and make a case for it. A few (3 out of 22) expressed a sense of disappointment about decision makers at their own and other institutions that *"talked the talk"* about serving culturally diverse audiences, but were *"simply unwilling to spend the money to develop bilingual exhibits."*

Despite the absence of definitive answers about why it's worth doing and the best way to produce bilingual exhibits, some museums (11 out of 22) moved ahead with bilingual exhibits, programs, and facilitation by bilingual floor staff, based on the premise that these are critical components to achieve relevancy with important groups within their community. These staff expressed the belief that use of Spanish language could make visitors feel more comfortable and give them access to information they might not otherwise have. But before they simply translated text into Spanish, these staff believed they must attend to the form and content of the experience, and make it culturally appropriate and socially engaging. One respondent spoke

for many when she said, *“It’s more than just speaking the language, writing the language, understanding the language, but actually understanding your audience.”* Among institutions with few bilingual exhibits (0-25% of current exhibits being bilingual), staff often expressed a desire for more information, purportedly so that they could make strategic decisions about how to maximize impact with bilingual visitors for their investment in bilingual exhibits.



The bilingual exhibit pictured above, created by Exploratorium Exhibit Services, illustrates the Stroop Effect, experienced as slower comprehension when reading a color word and seeing that same word in a different printed color. Non-color words do not elicit the Stroop Effect.

If you don’t read Spanish, you will not experience the Stroop Effect with this Spanish text (right) that says green, yellow, white, blue, purple, red, green, blue, etc.

Discussion of Findings

The creation of bilingual exhibits presents a complex set of challenges that extend far beyond translating text from English into Spanish. Language, an essential tool for communication, also signifies cultural identity, prestige, and power, defining social boundaries that include and exclude (De Mejía, 2002). Bilingual exhibits don't just make content accessible to wider audiences, bilingual exhibits carry symbolic value conveying who belongs in our learning institutions. With our nation's changing demographics and diverse language communities, informal science education organizations are considering their unique social contributions and their current financial realities. Many staff juggle numerous goals and feel constrained by limited resources. They want to know that their choices regarding bilingual exhibits will have the greatest impact.

Institutions face multiple competing priorities, balancing costs and the benefits, sometimes making decisions with incomplete information. None of the institutions in this study have fully analyzed the financial costs and benefits of bilingual exhibits. No formulae presently exist to calculate the value, necessity, or benefits of providing multilingual resources. Attuning to community needs and fulfilling an institutional mission does not eliminate the complexities and challenges in informal science education. However, institutions with a formalized commitment to bilingual exhibits and an audience-centered approach expressed that their visitorship increasingly represents the cultural diversity of their communities. The good news is that the institutions that commit to bilingual exhibits are making progress, although their understanding of how and why they are making progress is often limited. Institutions that were earlier in the process of adopting bilingual approaches tended to have a one-dimensional focus on the content of their bilingual interpretation. Institutions that had invested more time and resources in creating bilingual exhibits tended to have a multi-dimensional focus, including exhibit content, as well as social and cultural consequences of bilingual interpretation. With a deeper commitment came a deeper understanding of the affordances of bilingual interpretation, and what it means to these groups and communities. Therefore, the fact that Latino visitors understand English does not necessarily mean that the Spanish is unnecessary for them; it just may be necessary for reasons that aren't as obvious and are more nuanced, yet not any less important.

The Bilingual Visitor Research in a later section offers insight in understanding visitors' access to content through bilingual exhibits, and the more nuanced aspects mentioned above. As such, we looked to the findings from the ISE staff interviews to inform and complement our planned approach to the study; the research should be useful to practitioners to be useful for the field. Ultimately, the Bilingual Exhibits Research Initiative (BERI) aims to integrate professionals' concerns and questions uncovered by this study into a visitor research plan focused on who uses bilingual exhibits, how visitors use bilingual exhibits, and what outcomes result. With greater understanding of how bilingual exhibits affect visitors' learning and engagement with science, we can more knowledgeably consider the costs and benefits of our institutional investments. In addition, BERI will contribute to the evidence base that informs practice—to optimize informal science learning in museums and science centers for a diversity of learners. The table below (see

Table 3) includes the main findings from the staff interviews and implications for the on-site visitor research. Ultimately, BERI started with practitioners’ concerns and questions, grounded practice-oriented questions in theory, formulated and conducted visitor research to explore the use and consequences of bilingual interpretation in informal science learning environments

Table 3. Relevant Findings from ISE Staff Interviews and Implications for Research Study

ISE Staff Interviews Finding	Implication for Research Study
1. ISE professionals wanted to know if bilingual exhibits motivate people to attend their institution.	1. Include a question in the post-visit group interview asking whether the exhibit being bilingual would influence their attendance.
2. Many of ISE professionals expressed an interest in best practices, or finding out what works best with bilingual interpretation. They also asked what media, other than text, was most effective.	2. During the study, we will note any commonalities among the bilingual exhibition experiences at the four institutions. Special attention will be paid to non-text based approaches.
3. ISE professionals expressed a wide range of opinions about what Spanish speakers really need in terms of bilingual interpretation.	3. The research will, in part, answer what Spanish speakers’ perceived needs and experiences are, with a focus on the different affordances of bilingual interpretation above and beyond accessing the content. Meaning, while we focused on need, we defined need more broadly than a need for content.
4. Some ISE professionals demonstrated awareness that to meet Spanish-speakers’ needs, ISE institutions had to do more than just provide text in Spanish.	4. Interviews explored what elements (beyond the presence of Spanish text) make Spanish-speaking families feel welcome, comfortable, valued, and satisfied with their bilingual exhibit experience.
5. Some ISE professionals noted regional differences in use of Spanish language and that to bilingual approaches may also vary based on geography.	5. We decided to include some questions asking about the quality of the Spanish text, and whether anything was confusing to them. Additionally, any differences in language ability and preferences would be noted in coding the interviews.
6. Many ISE professionals were curious about how bilingual exhibit resources impacted experiences and outcomes for visitors.	6. This study looked at how bilingual families perceived the relationship between bilingual exhibits and outcomes such as group interaction, language use, access to content, and both emotional and cognitive reactions to the exhibit.

Bilingual Visitor Research

As indicated earlier, the purpose of the Bilingual Visitor Research was to provide the field with a source of systematically collected data about the affordances that fully bilingual exhibits have for bilingual or Spanish-dominant visitors to science-based institutions. The majority of the research questions for this project were focused on the Bilingual Visitor Research:

1. To what extent do individuals and groups physically engage with the bilingual exhibits (characterized by quality and quantity of engagement)? Which bilingual resources do they use, and how do they use them?
2. To what extent do visitors notice and understand the STEM-related content in the exhibits? What role, if any, do the bilingual materials available influence what visitors notice and understand?
3. To what extent do visitors feel comfortable with the content, presentation of information, and overall experience with the exhibits? Do bilingual materials affect their level of comfort?
4. How and where do members of the group interact with each other as they use the exhibit resources? Are these interactions in Spanish, English, or some combination?
5. To what extent do visitors make personal and/or cultural connections to the exhibition and its content? What role, if any, do the bilingual materials affect perceptions of relevance?

The instruments for the Bilingual Visitor Research study were developed based on a number of factors: the Bilingual Exhibit Experience model developed for this study, the ISE staff interviews, and advice from the advisors. The ISE staff interviews were especially informative in developing the instruments, as we asked the staff what they were most interested in finding out about the bilingual experience and wanted to make sure the study was useful for potential theory development and applied to practice.

Selecting Research Sites

The team selected research sites to satisfy multiple criteria. We wanted museums that had at least 5 years of experience developing bilingual exhibits at their institution and at least one fully bilingual permanent exhibition where we could conduct the study. In addition, to the extent that it was possible, we wanted the institutions to represent geographical diversity, so the museums weren't all in one part of the United States. Additionally, we aimed for diversity of informal science education settings, including natural history, science, and types of institutions. Based on the above criteria, the following four museums were included in the research study. There were also specific exhibits included in the Bilingual Visitor Research, based on criteria devised by the team and also the suggestions from the institutions. All of the exhibitions were fully bilingual, in English and Spanish.

- San Diego Natural History Museum, *Fossil Mysteries* – This permanent exhibition focuses on the rich fossil history of southern California and Baja California:

<http://www.sdnhm.org/exhibitions/current-exhibitions/fossil-mysteries/> . It is a very large exhibition, so in this project we focused on one room that deals with the geologic history of Southern and Baja California.

- Miami Museum of Science, *Moving Things* – This was a series of 10 hands- and minds-on exhibits focusing on how things move from place to place:
<http://www.miamisci.org/www/moving-things.html>
- Oregon Museum of Science and Industry, *A View from Space* – This traveling exhibition lets visitors see the world from a satellite’s perspective and includes interactive, hands-on science exhibits: <https://www.oms.edu/for-museum-professionals/traveling-exhibits/small/a-view-from-space/>
- Children’s Museum of Houston, *Cyberchase* – The Cyberchase exhibition is based on the PBS Kids show Cyberchase, and focuses on math skills for children :
<http://www.cmhouston.org/cyberchase/> . See <http://pbskids.org/cyberchase/> for the TV show page.

In deciding on which exhibits to include at each institution, we needed to include fully bilingual exhibits that were roughly the same size. We realized that the content would vary between the institutions, and that this may possibly affect the experiences within the exhibition. However, we acknowledged that this would be the case in bilingual exhibits across the field. The main goal of including multiple institutions was to ensure that by including a variety of institutions, exhibitions and approaches to bilingual interpretation that we would cover a number of experiences that could apply more broadly to bilingual interpretation being employed by science-based institutions.

Recruiting Participants

The research study focused on the affordances of fully bilingual exhibits for intergenerational Spanish-speaking groups, and thus necessitated finding groups that fit this general description. Since the team would be traveling to various states to collect data, it was important to increase the likelihood being able to find these groups when we went to the institutions to conduct the research. Many of the team members had experienced difficulty with recruiting Spanish-speaking groups in prior research and evaluation, so a decision was made to recruit groups ahead of time to ensure that the appropriate groups would participate in the study. The project hired four different local or regional third party firms, who had experience recruiting Latino audiences in each of the four cities: San Diego, Miami, Portland Oregon, and Houston. In order to ensure as much consistency in the groups as possible across the location, the team developed a set of criteria for the recruiting firms that needed to be met for participation:

- Language: Adult indicates that the primary language spoken at home is Spanish or Spanish and English equally. It was anticipated that this would give us both some members who either spoke only Spanish or were Spanish-dominants. We also anticipated that there might be a range of Spanish and English proficiency within individuals of a family group

- Intergenerational families (more than one age group in household)
- At least one child in the group between 7 to 12 years old. No children under 5 years old were included in the study.
- Group size: will range between 3 and 6 individuals.
- Museum-going experience: have visited at least 2 museums in the past two years
- No restrictions about whether they have visited the specific museum before

A total of 32 groups were recruited and participated in the study, with 8 groups at each of the four institutions. Recruitment firms used their own lists and other methods to recruit the groups electronically and by phone (recruitment methods varied some between the four firms). Once groups indicated that they met the criteria and said they were interested in participating, they were given a 90-minute period during which they needed to be at the museum. Each group was offered \$100 and free admission to the institution in exchange for their participation.

Groups consisted of at least one adult and one child in the age range of 7 to 12 years old, and met all the criteria outlined above; often groups included more than one adult and more than one child.

San Diego Natural History Museum groups:

1. Mother and 3 children (7, 8, and 10 years) accompanied by adult cousin and her child (10 years)
2. Mother, husband, and 2 children (9 and 12 years)
3. Mother, father, and child (10 years)
4. Mother and 3 children (10, 15, and 16 years)
5. Mother, husband, and 2 children (7 and 10 years)
6. Mother, adult female relative, and child (13 years)
7. Mother and 2 children (10 years)
8. Mother and child (10 years)

Miami Science Museum groups:

1. Mother, husband and child (7 years)
2. Mother and child (7 years)
3. Mother and child (12 years)
4. Mother Grandfather and 2 children (9 and 11 years)
5. Mother, husband and 3 children (5, 6 and 9 years old)
6. Mother and child (9 years)
7. Mother, husband and 2 children (7 and 12 years)
8. Mother and child (11 years)

Oregon Museum of Science and Industry groups:

1. Mother, and 3 children (5, 8, and 14 years)

2. Mother, husband, and 2 children (10 and 12 years)
3. Mother, father, and 2 children (9 and 11 years)
4. Mother, father, and 2 children (9 and 13 years)
5. Mother, father, adult male cousin, and 3 children (6, 7, and 12 years)
6. Mother, father, and 2 children (7 and 10 years)
7. Mother and 2 children (10 and 13 years)
8. Mother, father, and 2 children (11 and 15 years)

Children’s Museum of Houston groups:

1. Mother, husband and 2 children (8 and 14 years)
2. Mother, and 2 children (8 and 12 years)
3. Mother, boyfriend and 3 children (6, 11 and 16 years)
4. Mother, husband and 2 children (8 and 11 years)
5. Mother, boyfriend and 2 children (7 and 10 years)
6. Mother, Grandmother and 1 child (8 years)
7. Mother, husband and child (10 years)
8. Mother, and 5 children (two adult children; 11, 14 and 16 years)

Research Design and Institutional Review Board (IRB)

The Research Design for this study was a qualitative post-test only design; this means that groups were interviewed about their experiences only after they went through the exhibition. Given the lack of prior research on the topic and thus the exploratory nature of our study, a qualitative research approach was selected. This would allow for studying the range of factors identified in the Bilingual Exhibit Experience (BEE) model in a more open-ended manner. It also allowed for the emergence of unexpected factors related to the bilingual experience, suiting the more exploratory nature of the research

The research plan, methods and instruments went through an independent Institutional Review Board (IRB) approval process, through a certified company named Ethical and Independent Review Services, <http://www.eandireview.com/>.

Research Methods

To answer the research questions listed above, a qualitative approach was used, to gather information before, during and after a group visits the exhibition. This provided the proper context and understanding of the bilingual exhibition experience. As mentioned, some information was gathered during the recruiting process in order to determine that the groups met the criteria for participation in the study. When the groups arrived at the museum, adults were given written and verbal information about the study so that they were aware of the exact procedures the study would entail. If they were still willing to participate (and every group gave

their consent), they filled out informed consent forms for their participation, and parental consent forms for the children participating in the study.

Two main methods were employed in the research study. See Appendices C and D for the instruments used for these two methods:

1. **Observations of exhibition visit** – these were conducted in the bilingual exhibition, during the study, to determine how groups engaged with the exhibition and each other.
2. **Post-visit group interviews** – these were conducted in a separate room off the museum’s floor, in order to understand the group’s perception of their bilingual exhibition experience, prior expectations, comparisons to prior bilingual experiences, what it was like, and what they got out of the experience.

METHOD I: Observations of Exhibition Visit

The focus of observations was to capture visitor behaviors and interactions in the bilingual exhibition, specifically more related to the bilingual nature of the experience. Groups were prompted to go through the specific bilingual exhibit selected for the study like the normally would have if they came on their own, and to let the researchers know when they had finished with the exhibition. No further instructions were given for what to do in the exhibit. While they were going through, the researchers filled out an observation sheet, and stayed with the child in the target age range if the group split up since accurate observations could not be made on multiple people in different parts of the exhibit at the same time.

Data collected on the observation sheet included which elements they attend to and used, whether they read labels aloud or silently in English or Spanish, and whether they spoke to each other in English or Spanish. This information was recorded for each independent transaction at an exhibit component. For example, if a parent read a label in Spanish, then said something to a child, who then responded, this was recorded as three separate interactions. In order to gather additional context for the group’s interactions in the exhibition, the child in the target age range was fitted with a microphone and transmitter so some group conversation would be recorded. While the busy nature of the exhibits (i.e., ambient noise make a good bit of the audio unintelligible) and the exploratory nature of the study precluded a full analysis of the taped conversations they did provide examples of the interactions recorded on the observation sheets, some of which are noted below. See Appendix C for the observation instrument used to collect data.

Statistical Tests

For the more quantitative observational data we had hoped to use inferential statistical tests to help further illuminate differences beyond descriptive data (i.e., frequencies of behavior), but upon further examination we realized that a set of assumptions were not sufficiently to run the intended analyses. If the dependent or outcome variable is continuous, the test is performed with Analysis of Variance (ANOVA). If the outcome variable is categorical, this test is performed with a Chi-square test. Also, some of the outcome variables were binary, which would allow us to use a generalized linear mixed model. As we worked with the data, and ran the generalized linear mixed model analysis, there were some questions raised and we consulted with a higher level statistician who helped us review whether these tests were appropriate. We confirmed that the approach was valid, but that the data don't lend themselves to these sorts of analyses.

Both the ANOVA and the Chi square tests are based on the assumption that the measurements within and across treatments are independent or unrelated. If the experimental units are unrelated (i.e., not family members), and one measurement has been made per unit/group, then this assumption is reasonable. However, in the case of the BERI data, there were multiple observations of the family units, so the observations within each family unit were related. As a result, Type 1 statistical errors are increased, which will in turn inflate the p-value used to determine statistical significance. Type 1 statistical errors are false alarms, or false positives, finding a relationship that is not really there. We could get around this error by aggregating the data for each of the families, but this would result in fewer than 30 data points, which would not be a large enough sample size for the analyses. Therefore, we report the data below without the subsequent statistical analyses since the general criteria for the tests were not met.

Analysis of Observations of Visitors Using Bilingual Exhibits

The average number of interactions (i.e., read label or talked about something at the exhibit) among families observed at the selected exhibits was 39, but this varied widely by family and ranged from as low as 7 to as high as 138 observed interactions. Additionally, the number of total interactions of combined groups by site also varied widely, even though the same number of groups were observed at each institution (see Table 4).

Table 4. Interactions by Museum Site

Museum Site	Number of Interactions
OMSI	424
CMH	190
MSM	228
SDNHM	324

While this exploratory study was not set up to determine what specific factors affected the number of interactions, observations and follow-up interviews suggested that family dynamics and makeup (e.g., age of children; who was part of the group) the nature of exhibit (e.g., more hands-on vs. artifact focused), and the labels themselves (e.g., instructional vs. explanatory; actual number of labels in the exhibit) all played some role.

For example, the *Fossil Mysteries* exhibition at the SDNHM included a large number of artifacts and some interactives, while *Cyberchase* at CMH was comprised of hands-on interactives and no artifacts. The OMSI and SDNHM exhibitions also included more interpretation about phenomena while the mostly interactive nature of the CMH and MSM exhibitions meant that labels focused more on providing challenges and instructions (i.e., See if you arrange the colored shapes into a solid block that fits the space with no gaps) than explanations of specific facts or phenomena.

Overall Talk and Reading Frequencies

Collectively across all groups, we recorded almost **twice as many instances of talking behavior** compared to reading behavior (see Table 5).

Table 5. Interactions by Behavior Type

Behavior	Instances Recorded
Reading	389
Talking	777

There were also some differences in the frequency of reading and talking behavior between adults and children (see Table 6). In groups observed, **adults tended to read more** compared to children. Talking behavior was more evenly distributed.

Table 6. Reading and Talking Behavior, Disaggregated by Adult and Child

Person Talking	Reading Behavior	Talking Behavior
Adult	69%	55%
Child	31%	46%

Groups read the labels to identify objects and better understand what they were seeing. They also used interpretive information as jumping off points for conversation. Adults, in particular, tended to read and use the interpretive information to engage their children at the exhibit,

often pointing out details of what they were looking at or offering explanations about a phenomenon.

In the interaction below, for example, the **parents used the information (in Spanish) to help their child understand** the idea of fractions as he engaged with the interactive. (Notice also how the father connected the concept at hand to the child's previous school experiences.)

Father: Un cuarto es la medida. ¿Te acuerdas en la escuela lo que te enseñaron? Te acuerdas cuando estábamos haciendo la tarea y le entendías que era un cuarto, un tercio.

Mom: Aquí esta la información. Mira.

Child: Yo no la vi...Can I try?

Father: A quarter is the measurement. Do you remember what they taught you in school? Do you remember when we were doing the homework and you understood that it was a quarter, a third.

Mom: Here is the information. Look.

Child: I didn't see it...Can I try

In another example, the interchange, below, **a mom reads the Spanish label and uses the information to explain to the child what they are seeing.** (Notice how the mom switches between English and Spanish during the conversation while the child, while clearly understanding what her mom says in Spanish, speaks in English throughout this interaction.)

Adult: [reading Spanish label] This is...seven hundred and fifty million years ago. That's San Diego right there. Hold on. Press it.

Child: Nineteen seventy-six?

Adult: The impression was gathered then. That's the date.

Child: So, the circles are bigger than the seven?

Adult: The magnitudes, the Richter scale. Esto es dependiendo la fuerza del sismo.

Child: The circles in the front are equal to seven.

Adult: Es como cuando escuchas que te dicen: "fue de magnitud de seis." O sea, no fuerte porque la fuerza del sismo no es fuerte. ¿Te fijas? Aquí esta como por ejemplo este dependiendo la medida.

Child: How big it [the earthquake] is

Adult: Uh-huh

Adult: [reading Spanish label] This is...seven hundred and fifty million years ago. That's San Diego right there. Hold on. Press it.

Child: Nineteen seventy-six?

Adult: The impression was gathered then. That's the date.

Child: So, the circles are bigger than the seven?

Adult: The magnitudes, the Richter scale. This depends on the force of the quake.

Child: The circles in the front are equal to seven.

Adult: It's like when you hear them say:

"it was a magnitude of six." Or rather, not strong because the force of the earthquake is not strong. You see? Here this is how, for example, it depends on the measurement.

Child: How big it [the earthquake] is

Adult: Uh-huh

In this next example, the child noticed something, pointing it out to her **father who then used the Spanish interpretive information (along with the mom) to explain to his child what they are looking at.** (Notice the way the child introduces some English words as he reads the English text into his mostly Spanish-based conversation.)

Child: Wow. Papi, mira.

Father: Son las placas tectónicas

Mom: Y esto lo empuja para acá.

Father: Se activan los volcanes.

Child: Algo se empuja para arriba...Mira esto. You are here. Estas aquí. ¿Se puede mover? Look out. Mira.

Mom: Palm Springs— ¿donde esta Palm Springs? Mire. Venga. Mira acá.

Father: Los volcanes...

Child: Pa, mira ese. Wow. Mami, esto es así. Como que oyi algo así en mi clase, en science. Mira Mami, mira. Wow. Future. Abuelita. Past, present, future. Abuelita [ve] como se mueve también. California, Estados Unidos. Mira, Mexico. Y también allí. Mírela. Wow.

Mom: Los continentes estaban juntos.

Father: Antes que se separaran...Mira. Allí estaban 320 millones de años atrás. 120, 180 hasta como esta ahorita, mira. Luego como se van a mover en el futuro, mira. Mira en el futuro como baja California...se van a separar.

Child: Wow. Dad, look.

Father: They are the tectonic plates.

Mom: And this pushes it over here.

Father: They activate the volcanoes.

Child: Something is pushed up...Look at this. You are here. You are here. Can it move? Look out. Look.

Mom: Palm Springs— where is Palm Springs? Look. Come. Look here.

Father: The volcanoes...

Child: Dad, look at that. Wow. Mom, this is like that. I heard something like that in my class, in science. Look Mom, look. Wow. Future. Grandma. Past, present, future. Grandma [see] how it moves as well. California, The United States. Look, Mexico. And also there. Look at that. Wow.

Mom: The continents were together.

Father: Before they separated...Look. There they were 320 million years ago. 120, 180 up to how it is right now, look. Then how they are going to move in the future, look. Look in the future how Baja California... they are going to separate.

Language Used

Aggregated data indicated that **most groups used both Spanish and English during their time at the exhibits regardless of language they reported using in their household** (see Table 7).

Interestingly, even in some groups who reported using “Spanish only” in their household we recorded instances where one member in the group read or talked in English. Likewise, families who reported speaking Spanish and English equally at home read in Spanish and English almost equally and spoke in Spanish slightly more often.

Table 7. Percent of Instances Observed Reading or Talking by Language Used

Language Used in Household	% Instances Recorded			
	Read Spanish	Read English	Spoke Spanish	Spoke English
Spanish Only	63%	38%	76%	24%

Spanish Mostly	42%	58%	69%	31%
Spanish & English Equally	45%	55%	58%	42%

We did note differences between the language used by adults and children (see Table 8). **Adults tended to read in Spanish more frequently while children read in English more frequently.**

Table 8. Frequency of Reading Behavior by Language, Disaggregated by Adult and Child

Person Reading	Read in Spanish	Read in English
Adult	73%	35%
Child	27%	65%

Similarly, **adult respondents talked in Spanish more frequently** while children talked in English more frequently (see Table 9).

Table 9. Frequency of Talking Behavior by Language, Disaggregated by Adult and Child

Person Reading	Talked in Spanish	Talked in English
Adult	62%	39%
Child	38%	61%

These differences between adults and children were generally due to variation in language comfort and proficiency. With the exception of a few families where children did not speak English or were early English language learners, children were often more proficient at reading English primarily because English was the language they primarily used in school. Some children had few opportunities to practice reading in Spanish. While these children talked in Spanish more often than they read in Spanish, many generally reported being somewhat more comfortable with or preferring English; however, when they were around other kids who only spoke Spanish they spoke Spanish with them.

Additionally, many children understood Spanish and it was not uncommon, as seen in Tables 8 and 9 (Percent of Instances Observed Reading or Talking by Language Use) to see a mix of Spanish and English used among the group. (See section on code-switching below for further insights.)

For example, this transcript excerpt is from a group comprised of a mom (who was primarily a Spanish speaker) and her two children. While they often switched between languages, the two

children tended to speak in English among themselves, but switched between English and Spanish when talking with their mother.

Mom: ¿Que te pareció? ¿Te pareció bien?... ¿Ya viste este? Es como los satélites van registrando diferentes partes, nunca la misma porque el mundo siempre da vueltas.

Child 1 [older brother]: Que chévere.

Child 2: That is cool. Chévere.

Child 1: Este me gusta.

Mom: ¿Este del agujero?

Child 1 [older brother]: Si

[Both children then move to a different unit while mom lingers at the previous unit listening to the Spanish audio.]

Child 2: What is a weather balloon?

Child 1 [older brother]: It has some instruments on it and they measure the atmosphere like humidity, wind, air pressure. I don't know, that is something they should tell you [more about on the label].

Mom: What did you think? Did you think it was good?... Did you already see this? It's how the satellites are registering different parts, never the same because the world is always spinning.

Child 1 [older brother]: How cool.

Child 2: That is cool. Cool.

Child 1: This I like.

Mom: This hole?

Child 1 [older brother]: Yes

[Both children then move to a different unit while mom lingers at the previous unit listening to the Spanish audio.]

Child 2: What is a weather balloon?

Child 1 [older brother]: It has some instruments on it and they measure the atmosphere like humidity, wind, air pressure. I don't know, that is something they should tell you [more about on the label].

In contrast, in the example below, notice how the **mom speaks to the children almost exclusively in Spanish while the children speak almost exclusively in English**. Although they speak in different languages during their interactions, they are clearly talking with each other.

Mom: Mira, mira que bonito.

Child 1: Mama, they are all different! Este—

Mom: Ah, o sea son los cambios—

Child 1: Oh, look, they are all here: October. Hey mom, hey mom!

Mom: Pero, déjame ver.

Child 1: Oh, that one is really cool! Look that one is full of snow. That one is enero. Look.

Mom: Pero. ¿Que piensas que esta pasando aquí?

Child 1: It's Winter, so it's snowing....Oh, my god, that is a lot of snow right there!

Mom: ¿Cuándo tu fuiste allá [uninteligible] era tiempo que ya estaba nevando, no?...Mira, como que esta es tropical. Verano y otoño. Mas seco. [Reads question from label] “¿Cual mes es el mas seco, ese o ese?”

Child 1: Hey mama, could I look at that?

Child 2 (teen): This is the rocky mountains or what is this? Montañas nevadas.

Mom: Mira. See the color in here? Look at it from the statellite.

Child 1: Oh, my god!

Child 2: So it is like a satellite picture and this is like—

Child 1: I want to go there. It could be fun. That is interesting.

Mom: Look, look how nice.

Child 1: Mom, they are all different! This—

Mom: Ah, these are the changes—

Child 1: Oh, look, they are all here: October. Hey mom, hey mom!

Mom: Well, let me see.

Child 1: Oh, that one is really cool! Look that one is full of snow. That one is winter. Look.

Mom: What do you think is happening here?

Child 1: It's Winter, so it's snowing....Oh, my god, that is a lot of snow right there!

Mom: When you went there [unintelligible] it was the time [of year] when it was already snowing, no?...Look, how this is tropical. Summer and autumn. Drier.

Mom: [Reads question from label] "Which month is drier, this or this?"

Child 1: Hey mama, could I look at that?

Child 2 (teen): This is the rocky mountains or what is this? Snowy mountains.

Mom: Look. See the color in here? Look at it from the satellite.

Child 1: Oh, my god!

Child 2: So it is like a satellite picture and this is like—

Child 1: I want to go there. It could be fun. That is interesting.

Other times, different members in the group read the same label in the language they were most comfortable with and then came together to talk about it. One common scenario, for example, was having **adults read the Spanish text while children simultaneously used the English text**. In the exchange below, the adult read the Spanish labels throughout while the children in the group used the English version.

Mom: Mira, eso era Baja California. Mira como estaba y ahora como esta diferente.

Child 1: This is the lava...like, lava is really hot, that makes like rocks.

Mom: Después de la lava se hace piedra.

Child 1: Si, because it hardens. The lava hardens.

Child 2: Ya se.

Child 1: You know we're right here?

Mom: Si, aquí estamos.

Child 1: Ma, look. Look.

Child 3: This is the present and this[shows] the future...Look how it was and in the fuure, look how it's going to be.

Mom: La lava sale...creando un nuevo suelo marino.

Mom: Look, this was Baja California. Look at how it was and now how it's different.

Child 1: This is the lava...like, lava is really hot, that makes like rocks.

Mom: After the lava it becomes stone.

Child 1: Yes, because it hardens. The lava hardens.

Child 2: I know.

Child 1: You know we're right here?

Mom: Yes, we are here.

Child 1: Mom, look. Look.

Child 3: This is the present and this[shows] the future...Look how it was and in the fuure, look how it's going to be.

Mom: The lava comes out... creating a new sea floor.

Sometimes comments from children indicated that they were aware of the range of language use by different family members. The child in the exchange below, for example, pointed out to his parent that the information was also in Spanish, meaning she could also participate/better understand. The child then chose to continue in Spanish of her own accord, in part, to include her mom. (This was particularly interesting because even though the mom spoke some English, the child seemed to understand that Spanish was perhaps more comfortable or easier for her to understand.)

Child: Mami, do you want to see something interesting? You can do it. It's even in Spanish. Look at this, we can use three things.

Mom: Oh, that looks good. What does the Grand Canyon look like from space?

Child: What did you say it was?

Mom: You can do it either in English or Spanish.

Mom: This—where did Hurricane Charlie—

Child: Lo hago en ingles o español? [Answers his own question.] En español.

Mom: Ok.

Child: Mom, do you want to see something interesting? You can do it. It's even in Spanish. Look at this, we can use three things.

Mom: Oh, that looks good. What does the Grand Canyon look like from space?

Child: What did you say it was?

Mom: You can do it either in English or Spanish.

Mom: This—where did Hurricane Charlie—

Child: Do I do it in English or Spanish? [Answers his own question.] In Spanish.

Mom: Ok

Sometimes, a group member read parts of both labels (sometimes even just a word) as part of wrapping their mind around what they were seeing and understanding the content..

Adult: It's like a dinosaur.

Teen [as she looks at the label]: This is an extinct mega tooth shark. It's the upper lateral tooth. The extinct amphibious animal—this is the molar.

Adult: Amphibious. Anfibio.

Adult: It's like a dinosaur.

Teen [as she looks at the label]: This is an extinct mega tooth shark. It's the upper lateral tooth. The extinct amphibious animal—this is the molar.

Adult: Amphibious. Amphibian.

In instances where there were adults in the group with different language proficiencies, we observed the same behavior; each adult selected the language they were most comfortable reading and used that information to converse with the other adults in the group who might be reading the same label in the other language.

When data were disaggregated, we found some differences between sites in the frequency of Spanish and English use (see Table 10). At CMH and MSM, there were much higher percentages of families whose interactions were in Spanish compared with OMSI and SDNHM where Spanish/English interactions were more equally distributed.

Table 10. Percent of Interactions Recorded by Language Used and Museum Site

Language Used	OMSI	CMH	MSM	SDNHM
Instances of Spanish Use (Reading + Speaking)	52%	85%	77%	57%
Instances of English Use (Reading + Speaking)	48%	15%	23%	43%

While language proficiency may be one factor contributing to these differences, the general distribution of language use at home was fairly similar across sites. Thus, we could not

determine with certainty why there were differences between sites and **it seems that there are likely a range of factors influencing language selected.** It is worth noting for example, that some families actively encouraged the children in the group to read labels in Spanish (sometimes having them read the English then the Spanish version) as a way of helping children practice their Spanish reading skills:

Child [reading English label]: It is almost impossible to distinguish the shape of the Grand Canyon from a ground photo.

Mom: Ok. Ahora en español.

Child [reading Spanish label]: Es casi imposible distinguir la forma del Gran Cañón desde una foto terrestre.

Mom: Ok. Ahora vamos a ver este.

Child: No, this one, this one.

Mom: Ahora léanlo

Child [reads English label]: This area photo shows the northern border, the blue dot on the map, of the Grand Canyon National park.

Child [now reads the Spanish version of the same label]: Esta fotografía muestra el borde al norte, punto azul en le mapa, del parque nacional Gran Cañón.

Child [reading English label]: It is almost impossible to distinguish the shape of the Grand Canyon from a ground photo.

Mom: Ok. Now in Spanish.

Child [reading Spanish label]: It is almost impossible to distinguish the shape of the Grand Canyon from a ground photo.

Mom: Ok. Now we are going to see this.

Child: No, this one, this one.

Mom: Now read it.

Child [reads English label]: This area photo shows the northern border, the blue dot on the map, of the Grand Canyon National park.

Child [now reads the Spanish version of the same label]: This photo shows the northern border, the blue dot on the map, of the Grand Canyon National park.

Code-switching

During observations we noticed that **families often code-switched (i.e., switched back and forth between Spanish and English) during their interactions at the exhibit** (see Table 11). While the frequency with which a family code-switched varied, all but five of the families exhibited this behavior. (Of those that did not switch between languages four reported speaking only Spanish during the recruitment process. The fifth had reported speaking “mostly Spanish” during the recruitment, but indicated during their interview that the primarily spoke Spanish and that their children were early English language learners)

Table 11. Frequency of Code-switching

Language Switched to	Total Instances
To Spanish (from English)	157
To English (from Spanish)	160
Total	317

Code-switching occurred both during talking and reading behaviors, but families exhibited more code-switching behavior during their time talking with each other than during reading (see Table 12).

Table 12. Frequency of Code-switching Disaggregated, by Speaking and Reading Behaviors

Language Switched to	For Speaking	For Reading
To Spanish (from English)	116	43
To English (from Spanish)	85	81
Total	201	124

Thus, groups tended to use one language for reading more consistently (though not exclusively), but **moved fluidly between Spanish and English during conversations**. In the excerpt below from a conversation between a mother and child, for example, notice how the mother and child used both English and Spanish as they discuss the Earth’s shifts over millions of years. (Code-switching instances are underlined.)

Mom: *O sea, supuestamente estás piedras venian de acá y con el movimiento se quedaron aca en el oeste, o sea en el west. Y por eso están acá en San Diego, es lo que están enseñando aquí, como llegaron.*

Esto es una imagen de satélite, los satélites están arriba en el cielo, en el universo. So it's showing you where the plates collide. What would that be? Forty to eighty million years ago.

Child: So it goes from here and then it starts opening?

Mom: Muevele. Mira, mira te fijas este movimiento. Muevelo tú. [unintelligible] Esto es lo que sale en los volcanes [unintelligible] O sea, a conforme está así no hay lava pero cuando lo vuelves a bajar esto va bajando y la lava va saliendo. ¿Te fijas como eleva?

Child: It goes up. It's going all the way up, and when it goes down it's going down.

Mom: Gravity pulls on the plate's leading edge, and the rest of the plate follows....Magma erupts onto Earth's surface to form volcanic rock. O sea, es todo esto pues. Tu magma es esto, lo que va dejando y lo que se queda por encima.

Child: And then when it explodes?

Mom: Uh huh. Over time the descending oceanic plate continues to melt adding volcanic rock to the underbelly of the continent and lifting up the continental plate. O sea que los va elevando ¿Te fijas como este se ócuando le dabas al revés? Este se mueve hacia acá y este se baja y luego le subes cuando hay - pero cuando tienes acción de esa magma este se eleva

Mom: Supposedly these rocks came from here and with the movement were left in the West, that is, in the west. And that is why they are here in San Diego, that's what they are teaching here, how they arrived.

This is a satellite image, the sattelites are up in the sky, in the universe. So it's showing you where the plates collide.

What would that be? Forty to eighty million years ago. This plate movement helped to form the mountains of the Sierra Nevada.

Child: So it goes from here and then it starts opening?

Mom: Move it. Look, pay attention to this movement. Move it. [unintelligible] This is what comes out of volcanoes [unintelligible] Meaning, when is like this there is no lava but when you move it down again this is going down and the lava is coming out. Do you notice how it rises?

Child: It goes up. It's going all the way up, and when it goes down it's going down.

Mom: Gravity pulls on the plate's leading edge, and the rest of the plate follows....Magma erupts onto Earth's surface to form volcanic rock. Or, that's all then. Your magma is this, what is leaving and what is left over.

Child: And then when it explodes?

Mom: Uh huh. Over time the descending oceanic plate continues to melt adding volcanic rock to the underbelly of the continent and lifting up the continental plate. Meaning it is making it rise. See how it when you were moving it backwards? This one moves this way and this lowers and then it rises when there is—but when you there is some action from that magma this rises.

This example involved a child, mother, and grandfather. Notice how the child switches between English and Spanish depending on who he is speaking to.

Child: Vamos a ver esta...The red block [unintelligible]

Mom: We are trying to pack the suitcase.

Child: I know, but take this out so—

Grandfather: Cada uno tiene su forma, cada uno—

Child: No entra este aquí.

Grandfather: Tienes que ir cogiéndolo despacio.

Child: Let's go see this...The red block [unintelligible]

Mom: We are trying to pack the suitcase.

Child: I know, but take this out so—

Grandfather: Each one has its own shape, each one—

Child: This doesn't go here.

Grandfather: You have to take it slow.

While the frequency of code switching was only slightly higher for adults compared to children, data indicated that children switched from Spanish to English more often while adults switch from English to Spanish more often (see Table 13).

Table 13. Frequency of Code-switching Disaggregated by Adult and Child

Language Switched to	Adult	Child
To Spanish (from English)	120	36
To English (from Spanish)	53	107

Discussion of Observation Findings

There was a sizable variation in the total number of interactions in groups by site. This indicated that there might have been several factors that accounted for this difference, including the group makeup, the nature of the exhibit and the interpretive resources available such as the number of labels. While this exploratory study was not designed to measure or control for these variables, data indicated that there are a broad range of factors that may influence these interactions. Now that this has been noted, further study of the specific factors that affect the occurrence and frequency of these behaviors would be useful to the field.

Not surprisingly, observation data indicated that visitors used labels in similar ways to what has been documented by others in the literature (Silverman, 1997; Perry, 1992; McManus, 1987; Diamond, 1986). Consequently, as might also be expected, visitors used interpretive labels (and audio) to identify what they were looking at, learn more about an artifact or phenomenon, understand what they were supposed to do (in the case of more hands-on exhibit units) and as springboards for conversation. The differences in reading behaviors between adults and children also seem consistent with the literature. In groups observed, adults tended to read labels more than twice as often as children and used the interpretive information to engage their children in the exhibits.

Observations also were consistent with previous research (Garibay, 2009b; Ash, 2008; Garibay, 2004) indicated that families used the bilingual resources in a range of ways—all based on their particular group's needs and language preferences. In some groups where adults were most comfortable in Spanish, they used the Spanish labels to engage and guide their children. In other groups where an adult spoke Spanish and some English, they might use primarily Spanish labels, but occasionally English ones. Children might read mostly English labels, but during the course of their time at the exhibition might also use Spanish labels as well (Garibay, 2004, Garibay and Gilmartin, 2003).

The various ways groups used these bilingual resources and the distribution of interactions across both Spanish and English and, in particular, the frequency of code-switching illuminates the complexity of language use. Previous research (Garibay, 2009b; Garibay, 2004) has suggested that some Spanish-speaking groups tended to use both sets of interpretive labels for a range of reasons, including to clarify the meaning of a word or idea or to share information with other in their group who were not bilingual, and even to help children build their bilingual vocabulary skills and our findings seem consist with these findings and further illuminate the complexity of the bilingual experience and how this plays out in informal learning settings.

Rather than thinking of visitors' as either being English or Spanish speakers, a more accurate description is that Latino families often include visitors on a bilingualism spectrum and that the ways they use bilingual resources is based, in large part, where they and other members of their group are. Many social groups moved fluidly between the two languages, with different members of the group drawing on English and Spanish text to weave into their conversation.

François Grosjean (1996, p.23), the renowned psycholinguist, for example, describes this spectrum:

“Bilinguals find themselves at various points on a situational continuum which will result in a particular language mode. At one end of the continuum, bilinguals are in a totally monolingual language mode in that they are interacting with monolinguals of one - or the other - of the languages they know. One language is active and the other is deactivated. At the other end of the continuum, bilinguals find themselves in a bilingual language mode in that they are communicating with bilinguals who share their two (or more) languages and with whom they can mix languages (i.e. code-switch and borrow)....These are end points but bilinguals also find themselves at intermediary points depending on such factors as interlocutor, situation, content of discourse and function of the interaction.”

He continues:

“Bilinguals are now seen not so much as the sum of two (or more) complete or incomplete monolinguals but rather as specific and fully competent speakers-hearers who have developed a communicative competence that is equal, but different in nature, to that of monolinguals. This, in turn, is leading to a redefinition of the procedure used to evaluate the bilingual's competencies. Bilinguals are now starting to be studied in terms of their total language repertoire, and the domains of use and the functions of the bilingual's various languages are now being taken into account” (Grosjean, 1996, p.22).

METHOD II: Bilingual Visitor Research

The purpose of the interviews was to understand the group's perception of their experiences at the exhibition, including what they thought about the bilingual opportunities, how they interacted with each other and what they got out of the experience. After the group told the interviewer they were done with the exhibit, they all went to a room off of the museum floor where the interview could be conducted in a quiet environment. The interviews were audio recorded and later transcribed. The time of the interviews varied, from around 15 minutes to as long as 45 minutes, depending on the group. When the interviews were completed, the groups were given the incentives for participation. See Appendix D for the interview instrument, in English and Spanish. While there were interview questions included in a guide, the researcher did not always ask every question and if new topics came up they were investigated. In this manner, there was a protocol followed and most groups covered most questions, but we would also not miss any interesting new topics that emerged simply to follow the protocol – this follows the open-ended exploratory nature of the study design.

Analysis for Group Interviews

The approach for analyzing the open-ended interview data first involved having all 32 group interviews transcribed into word documents. The researchers decided that a more deductive coding approach would be best, in which the themes and patterns coded were more emergent from the data rather than being determined before the coding began. Since so little research had been done on bilingual exhibit experiences this was the best approach in order to not miss any new themes that occurred, or have preconceived notions about what the data would reveal impact the process. In order to ensure that the two researchers coding the interviews were as consistent as possible, they each independently read through four different interviews (or one-quarter of the total interviews) and took notes on the types of codes that emerged from the data. Afterwards, they discussed the codes and came up with a coding scheme. They independently coded two of the interviews, then noted and reviewed any discrepancies in the coding; this increased the inter-rater reliability of coding the interviews. Finally, each of the two researchers coded 16, or one half, of the transcribed group interviews.

Given the more open-ended nature of the interviews, the fact that not every interview included every question, and that researchers pursued interesting topics of conversation as they came up, the analysis for this research project does not go question by question. Oftentimes, themes and topics bridged across responses and specific questions so instead one general coding structure was used across all questions and conversations within an interview. These were then compiled and compared across institutions. See Table 14 for descriptions of the main coding categories that emerged from the interviews.

It was not surprising that the interviews covered quite a variety of themes, given how open-ended they were. The following twelve main coding categories emerged from the interviews, with additional subcategories included as appropriate, which was for most of the main categories below.

Table 14. Main Coding Categories and Descriptions

Main Coding Category	Description of Category
Access to Content	Bilingual interpretation making it easier to understand or learn the content in the exhibition
Positive Emotional Reaction	How having the text bilingual affected their feelings about the visit (e.g., enjoyment, confidence, comfort)
Suggestions for Museum Welcoming Spanish Speakers	Ways that the museum could improve the experience for Spanish-speakers
Label Translation and Interpretation	When groups made specific comments about how the bilingual text was translated or designed
Positive Impact on Adult Experience	Explanations of the positive impact having bilingual interpretation had on the adult experience (e.g., able to facilitate, not relying on kids, etc.)
Practicing/Learning Specific Language/Both Languages	How the bilingual text allowed for practicing one of the two languages: Spanish-speakers practicing English, and English-speakers practicing Spanish
Own Language Practices at Home	One question asked about bilingual practices at home, which language they might speak more frequently
Group Interaction	In reference to how the bilingual nature of the exhibition changed how the group interacted with each other
Positive Impact on Perception of Institution	These comments were about how the presence of a bilingual exhibition might make them feel differently about the institution
Comparison to Non-Bilingual Experiences	What the current experience might have been like had it not been bilingual, drawing on their experiences in non-bilingual situations
Code-Switching	This phenomenon occurs when bilingual groups switch effortlessly between Spanish and English, sometimes in the middle of a sentence
Connection to Culture	How the bilingual experience extended beyond language and might have allowed for a deeper connection to culture

It is important to note that each “code” often included more than one sentence, or more than one person’s comments on their own. Often, the code included an exchange between the interviewer and more than one member of the group, since the interviews were conducted with the whole group rather than one individual. Additionally, there were many times where one part of the conversation was coded in more than one sub-category; multiple codes were allowed for the same sentence and thus group of text from the transcription.

As can be seen in Table 15, there were a total of 525 codes assigned for the group interviews, across all four sites. While there was some variation across they were relatively even, ranging from a low at OMSI (101 codes), a slightly higher count at CMH (117 codes), to higher codes at Miami (153 codes) and San Diego (154 codes). Since the codes were applied from single sentences to larger paragraphs of transcribed conversation, a lower or higher number of codes does not translate directly to one site being “better” or “higher” than another. Additionally, the frequency of specific codes was sometimes more a reflection of the kinds of questions we were asking, so that the more directly we asked about something (e.g., ways to improve the experience for Spanish-speakers) the more frequently codes showed up (see Appendix D for instruments).

Of the main categories, the most common codes were Access to Content (136 or 26% of codes) and Positive Emotional Reaction (77 or 15% of codes). These were followed by Suggestions for Museum Welcoming Spanish Speakers (52 or 10% of codes), comments about the Label Translation and Interpretation (51 or 10% of codes), Positive Impact on Adult Experiences (48 or 9% of codes), and Practicing/Learning Specific Language/Both Languages (46 or 9% of codes). Other main coding categories included Own Language Practices at Home (32 or 6% of codes), Group Interaction (24 or 5% of codes), Positive Impact on Perception of institutions (22 or 4% of codes), and Comparison to other Non-Bilingual Experiences (19 or 4% of codes). The last two main coding categories included Code-switching (11 or 2% of codes) and Connection to Culture (7 or 1% of codes).

What this means is that a good bit of the conversation around the affordances of bilingual interpretation was centered around having access to content while engaged with the exhibit; one out of four codes were about access to content. There also was an importance placed around the way having bilingual interpretation made them feel; almost one in five codes was about having a positive emotional reaction to this approach. There were many suggestions groups had for making institutions more welcoming to Spanish-speakers, and quite a few of the groups also noted specific things about the translation and design of the bilingual labels. Both of these groups of comments should be useful for institutions that are interested in providing bilingual interpretation for visitors. The next set of responses will prove useful for giving justification around bilingual interpretation, since they included comments about how having bilingual exhibits positively impacted the experience for adults, and how they also provide opportunities for Spanish-speakers to practice English, and English-speakers to practice Spanish. The remaining categories, as explained below, will also provide useful information to those considering including bilingual interpretation. Each of these twelve main coding categories are listed and discussed below.

Table 15. Group Interview Totals for Main Coding Categories, by Site (#)

Main Coding Category	San Diego (SDNHM)	Oregon (OMSI)	Miami (MSM)	Houston (CMH)	TOTAL across sites	% across sites
Access to Content	47	35	27	27	136	26%
Positive Emotional Reaction	22	6	31	18	77	15%
Suggestions for Museum Welcoming Spanish Speakers	8	15	9	10	52	10%
Label Translation and Interpretation	15	8	16	12	51	10%
Positive Impact on Adult Experience	13	7	17	11	48	9%
Practicing/Learning Specific Language/Both Languages	17	12	8	9	46	9%
Own Language Practices at Home	6	6	10	10	32	6%
Group Interaction	5	1	12	6	24	5%
Positive Impact on Perception of Institution	8	4	1	9	22	4%
Comparison to Non-Bilingual Experiences	2	5	10	2	19	4%
Code-Switching	8	1	2	0	11	2%
Connection to Culture	3	1	0	3	7	1%
TOTAL for each site	154	101	153	117	525	

NOTE: SDNHM (San Diego Natural History Museum), OMSI (Oregon Museum of Science and Industry), MSM (Miami Science Museum), CMH (Children’s Museum of Houston)

Below are explanations for each of the main coding categories, as well as the frequencies and quotes for many of the sub-categories.

Access to Content (136 total codes; 26% of all codes) – When talking to staff at institutions either already providing bilingual interpretation or considering it, access to content is the main and usually the first reason that is given. As mentioned above, this was the largest category, and the main topic of conversation during the group interviews around the topic of the affordances of bilingual interpretation. When looking at the breakdown of specific sub-categories of Access

to Content (see Table 16), the most common reason given was that it was **easier to understand or learn in your own language**:

Interviewer: Y ¿qué piensan de la gente bilingüe que entiende inglés y español igualmente, qué piensan que van a leer en inglés o en español o los dos?

Father: Pues los dos lo pueden hacer pero ellos su primera no van a batallar, o sea lo -- si están en inglés pues ellos ya lo ven en inglés y ya rápido. Como por ejemplo, lo que yo pienso que lo están haciendo aquí es para que vengamos nosotros desde Tijuana y lo vean el museo y entonces tienen más gente, porque la de aquí pues ellos vienen y ven la información de aquí y su primer idioma de ellos de aquí es [unintelligible].

Mother: Y yo pienso lo mismo que él por ejemplo la gente que es bilingüe es la que pudiera a lo mejor opinar que no, que está sobrecargada la información pero sería una forma egoísta el poner nada más un idioma y estando en frontera, ¿verdad? Y que por ejemplo mucha gente que hablamos español no podríamos tener la misma oportunidad de entender lo que están diciendo.

Y lo que dice mi esposo es cierto, la gente que es bilingüe uno se va sobre su lenguaje nato, pues el lenguaje, sobre su idioma principal pues. Los que son bilingües lógicamente van a leer in inglés, nuestro lenguaje principal es el español, el español. Pero si estuviera nada más en inglés se nos niega la oportunidad a mucha gente hispana que vivimos aquí o que venimos de Tijuana el tener la oportunidad de ver cosas tan impresionantes y tan importantes que hay en información. Y sobre todo para las generaciones que vienen. Yo pienso que está -- A mí se me hace magnífico el hecho de que sea bilingüe, para mí es muy importante que sea bilingüe. Y es una de las cosas que yo le digo a mi esposo, ah pues si es bilingüe pues qué suave. Pues entonces con muchas más ganas uno trae a los niños porque ella se puede retirar y puede estar leyendo tranquilamente el español, no tiene que estar diciendo "mamá, ven a explicarme" si es algo que entendió. El niño lo mismo.

Interviewer: What do you think about the bilingual people that understand English and Spanish equally, do you think they will read in English or Spanish or both?

Father: Well, it can be both but first they're not going to compete, that is -- if they are [speaking] in English then they're going to look at it in English and go quickly. Like for example, what I think is happening here is that we come from Tijuana [Mexico] and see the museum and a lot of people, because people from here they come and see the information and their first language is [unintelligible]

Mother: And I think the same as him, for example bilingual people could say the information is too much, but it would be pretty selfish to have only one language at the border [near Mexico] right? And for example many people who speak Spanish couldn't have the same opportunity to understand what is being said.

And what my husband said is true, with bilingual people you focus on your native language since it's your first language. Bilingual people are logically going to read in English, our first language is Spanish, it's Spanish. But if there were nothing more than English it would deny the opportunity to many Hispanics that live here or coming from Tijuana the opportunity to see such impressive and important things in the information. And all the generations that come. I think that it's -- to

me it's magnificent that it's bilingual, for me it's very important that it's bilingual. And that's one of the things that I say to my husband, ah yes it's bilingual, how nice. Since many want to bring children you can relax and be reading Spanish, you don't have to be saying "Mom, come explain it to me" if it's something that's understood. The same for the child.

It was also discussed that simply having the text in Spanish gave people **better access to content**:

Mother: Porque viene mucha gente que es de habla en español, entonces, también vienen muchas personas que vienen de otros países, entonces, yo creo que es un beneficio para ellos y para las personas que vienen a visitar el museo.

Mother: Because many Spanish-speakers come, also a lot of people come from other countries, I think it's a benefit for them and for the people who come to visit the museum.

Mother: Si, el museo quiere atraer a las personas de habla hispana o sea yo pienso que es algo que tienen que tomar mucho en cuenta, porque pues, la verdad que casi no -- es triste -- pero es la verdad que casi no vienen las personas Latinas a museos y a lugares así y a lo mejor estando el idioma presente se les hace más -- porque también muchas veces si vienen y no entienden lo que están viendo y -- oh pues ¿qué es eso? y o sea -- ay no sabes qué me aburrí ya no vuelvo a venir -- en cambio si esta algo en el idioma pues llama la atención entonces a lo mejor pueden venir con más frecuencia. Y para el museo yo pienso que eso estaría bien porque eso atrae más gente.

Mother: Yes, the museum wants to attract Spanish-speakers or that is I think that it's something the museum has to realize, because well, the truth is that almost none – it's sad – but it's the truth that Latinos pretty much don't come to museums and places like them, at least having the language present would make them come more – because also sometimes if you see and don't understand what you're looking at – oh, well, what's that – you know, I'm bored already and I won't return – however is there is something in your language then it gets your attention then and at best you can come more frequently. And for the museum I think that it would be good because that attracts more people.

Another main reason given was that it is simply better for Spanish speakers to have the content in both languages, and that it was **easier to understand when it was in two languages**. This last point was one that came up at different times and in different ways during the study; Spanish-speakers repeatedly told us that it was not just about being able to understand the Spanish, but that having both languages available had many benefits, including accessing the content more effectively:

Mother: Sí, también lo puede usar uno como para aprender porque, lo lees en español y lo puedes leer en inglés y más o menos te puedes dar una idea de lo que te están queriendo decir en inglés, porque cuando se traduce, el español no se traduce letra por letra, o sea palabra por palabra, entonces, si tienen alguna duda, pueden leer ahí, y les da, como referencia.

Mother: Yes, also you can use it to learn [the bilingual text] because, you read it in Spanish and you can read it in English and more or less it gives you an idea of what it's trying to say in English, because when it's translated, the Spanish isn't translated letter-by-better, that is word for word, then if you aren't sure you can read it there and there is it, like a reference.

Child [spoke in English]: For me it was good practice because since in my school I read more English and everything and then I also learn how to read in Spanish, so it was a good practice to read both of them at the same time.

Group interaction also came up around how bilingual interpretation can impact the experience, with some groups saying that it meant that **everyone in the group can engage together** around the content:

Husband: Yo creo que es importante por que también hay gente que en nuestra familia que entiende ingles pero no lo escribe entonces el leerlo es difícil para ellos. Entonces yo puedo traer a la abuelita, a alguien que entiende ingles pero esta acostumbrado a usar el ingles lo escuchan pero no están educados a leerlo. Entonces tenerlo en español es una cosa muy buena porque puedes traer a la abuelita, puedes traer a un familiar que esta de visita, de otro país que hable solamente español. Lo puedes traer y hacerlo disfrutar un día agradable.

Husband: I think it's important because there are people in our family that understand English but don't write it so reading it is difficult for them. Then I can bring the grandmother, who understands English but is used to using English to hear but it's able to read it. So having it in Spanish is a good thing because you can bring the grandmother, you can bring a family member who's visiting, from another country, who only speaks Spanish. You can bring them and enjoy a nice day.

Table 16. Access to Content Sub-Categories, by Site (#)

Access to Content sub-categories	San Diego (SDNMH)	Oregon (OMSI)	Miami (MSM)	Houston (CMH)	TOTAL across sites
Easier to understand/learn in your own language	14	14	17	8	53
Better for Spanish speakers	17	10	7	11	45
Easier to understand/learn when in two languages	10	8	0	5	23
Everyone can engage together around the content	4	0	3	2	9
All can engage, regardless of language skills	1	1	0	1	3
Some speak English but don't read it	0	2	0	0	2
Access to content (general)	1	0	0	0	1
TOTAL for each site	47	35	27	27	136

Positive Emotional Reaction (77 total codes; 15% of all codes) – The second most common topic of conversation during the group interviews was the fact that having bilingual interpretation can have a positive emotional impact (see Table 17). The main emotion that groups mentioned was **feeling more confident or comfortable** during their visit:

Mother: Pues el hecho de tenerlo en tu lengua se siente ya cómodo para empezar. Entonces a mí se me hace algo it's welcoming. Te hace sentir un poquito más bienvenido.

Mother: Because the fact of having it in your language makes you feel more comfortable to begin. Then to me it makes something more welcoming. It makes you feel a little more welcome.

Mother: A mí me hizo sentir más cómoda, porque entendí mejor, entonces me sentí más cómoda en verlo lo que yo estaba leyendo, tanto en inglés como español. Me hizo sentir más cómoda. Con más conocimiento.

Interviewer: ¿Y ustedes?

Father: También, pues igual. Es un museo y debe de tener más información en diferentes idiomas, porque no nada más vienen americanos aquí, viene más gente.

Mother: It makes me feel more comfortable, because I understand better, then I feel more comfortable in seeing what I'm reading, as much in English as Spanish. It makes me feel more comfortable. More knowledgeable.

Interviewer: And you all?

Father: The same. It's a museum and should have the information in different languages, because more than Americans come here, more people come.

Groups also mentioned that having bilingual interpretation helped them **enjoy the visit more, or meant they weren't as frustrated:**

Madre: No lo van a entender nada. A parte de que me parece que una se siente frustrada. Hay mi hijo yo no sé -- yo no sé si como padre, pues se supone que el padre tendría que enseñarle, se siente como frustrado por no poder darle una explicación al niño.

Madre: [If only in English] You aren't going to understand anything. Besides, it seems like one would feel frustrated. There is my son and I don't know -- I don't know if as a father, well I suppose that the father would have to teach them, you'd feel frustrated to not be able to explain it to the child.

Ignacio: Aquí es importante, pero como, si no hubiera el español, los papás de los niños no estarían interesados porque, ellos no van a poder explicarles, se van a sentir mal. Ahora que está en español, veo que más personas traen a sus hijos, y les pueden explicar bien porque está en español. Les facilita a ellos el explicarle a sus hijos, entonces, se sienten más agustos en traerlos.

Ignacio: Here it's important, but how if it weren't in Spanish, the parents of the kids would not be interested because, they are not going to be able to explain things, they're going to feel badly. Now that it's in Spanish, I see that more people bring their children, and they can explain things well because it's in Spanish. They can facilitate the explanation to the kids, then, they feel better about bringing them.

There was also a theme that emerged about feeling like they would be **more inclined to bring the whole family** when the text was bilingual, since some might not be able to understand English. This included family members living in the household as well as being able to bring family members who might travel to the United States (especially from Mexico):

Mother: Eso esta perfecto. Porque por ejemplo yo si me hubiera traído a mi mamá y a mi papa conmigo ellos pudieran ser parte y no tendrían que tener a alguien más traduciendo. Eso es una ayuda bastante buena.

It's perfect Because for example I can bring my mom and father with me and they could be a part of it and not have to have anyone translate for them. That is a very big help.

Father: Sí, por ejemplo, si no hubiera estado en español ella se hubiera aburrido más rápido y habríamos estado menos tiempo en el museo.

Father: Yes, for example, if it hadn't been in Spanish she would have been bored more quickly and we would have spent less time in the museum.

Additionally, there was a sense that having positive feelings during the visit had to do with the **museum making an effort** to provide a positive experience. This resulted in the groups feeling like they were **being purposefully included**:

Fernando: A mí me pareció un lugar muy bonito, impresionante, porque más que nada es como mucho de ciencia pero a la vez lo hace divertido para los niños y fácil de entender para nosotros los adultos también. Y me gusta que hay letreros en inglés y en español. Me hace sentir como que soy bienvenido al museo y de cierta forma me hace sentir como que se están enfocando en mí y que piensan también en nosotros los hispanos, por los letreros bilingües y también porque hay opciones para inglés y español en algunos juegos.

Father: To me it's a very beautiful place, impressive, because more than anything it has a lot about science but at the same time it's fun for kids and easy for us adults to understand as well. And I like that the text is in English and Spanish. It makes me feel welcome at the museum and in a certain form makes me feel like they're focusing on me and thinking about Hispanics, for the bilingual text and also the options in English and Spanish for some games.

Table 17. Positive Emotional Reaction Sub-Categories, by Site (#)

Positive Emotional Reaction sub-categories	San Diego (SDNMH)	Oregon (OMSI)	Miami (MSM)	Houston (CMH)	TOTAL across sites
More confident/comfortable	10	2	11	6	29
Enjoyment/lack of frustration	6	0	8	4	18
Can include/bring everyone in the family	3	1	4	5	13
Feel included/not excluded	1	1	6	3	11
Gravitate to native language, more comfortable	1	2	2	0	5
Positive emotional reaction (general)	1	0	0	0	1
TOTAL for each site	22	6	31	18	77

Suggestions for Museum Welcoming Spanish Speakers (52 total codes; 10% of all codes) – A question asked in most interviews specifically inquired about ways that the museum could make the institution more welcoming for Spanish-speakers, and groups were able to come up with some specific suggestions (see Table 18). The most common suggestion, which made up more than one-third of all suggestions, was for the institution to **reach out to Spanish-speakers more, in Spanish**:

Father: O a lo mejor también marcar publicidad de que también están en los dos idiomas para que vengan a visitar.

Mother: ¿Cuál tipo de publicidad?

Father: Pues ya ven que dan folletos, ustedes dan. A ver, pasen al museo, tenemos exhibiciones en español y tenemos exhibiciones en inglés, bilingüe.

Father: The best would be to have publicity that is in both languages so people come to visit.

Mother: What type of publicity?

Father: Well if they see that you have brochures, you have them. Let's see, they pass by the museum, we have exhibitions in Spanish and we have exhibitions in English, bilingual.

Mother: Estoy tratando de pensar. Porque a mí como está el museo me gusta. Me gusta tal y como está. Y me gusta también que tengan eventos para la familia mexicana, también tienen eventos de – el jueves en la tarde es gratis para todo los que quieran venir. Eso también me gusta. Pero como le digo, falta promoción para los hispanos. Pero sí pienso que a lo mejor quizás un día, por ejemplo un domingo que compres un adulto y te den un niño gratis también eso sería muy bueno, porque yo creo que ahorita todos están tratando de ahorrar.

Daughter: Ahorrar, como está todo. Entones ya paga uno el boleto del adulto, por ejemplo, yo vendría y ya vendría él gratis.

Mother: I'm trying to think. Because I like how the museum is, I like it. I like how it is. And I also like that they have events for Mexican families, also they have events – Thursday afternoon is free for everyone who wants to come. That I also like. But like I say, it lacks promotion for Hispanics. But I think that the best is perhaps a dia, for example a Sunday where you buy an adult [ticket] and one child is free would be very good, because I think that now everyone is trying to save.

Daughter. Saving, that's it. Then you already pay one adult, for example, I would be free.

Other specific suggestions included **having more Spanish-speaking staff, providing guided tours in Spanish** and having **printed materials in Spanish in the exhibits**.

Table 18. Suggestions for Museum Welcoming Spanish Speakers Sub-Categories, by Site (#)

Suggestions for Museum Welcoming Spanish-speakers sub-categories	San Diego (SDNMH)	Oregon (OMSI)	Miami (MSM)	Houston (CMH)	TOTAL across sites
Reach out to Spanish-speakers (marketing, p.r.)	3	4	6	5	18
Suggestions for Museums for Welcoming Spanish speakers (general)	2	7	3	3	15
Spanish-speaking staff	1	0	6	0	7
Guided tours in Spanish	1	2	2	0	5
Printed materials in exhibit	1	1	1	1	4
Logistics for getting around the museum	0	1	1	1	3
TOTAL for each site	8	15	19	10	52

Label Translation and Interpretation (51 total codes; 10% of all codes) – While not something that was a main focus of the study and no specific sub-categories were created for this main coding category, groups offered quite a bit of positive feedback about the **quality of the translation** of the bilingual material at each of the four sites. They talked about how the English was translated well into Spanish, that the words made sense and you could tell native speakers had written the labels. They also commented some on the **design of the bilingual materials**, talking about how it was easy to identify which language to attend to.

Positive Impact on Adult Experience (48 total codes; 9% of all codes) – Some of the adults interviewed talked about how having bilingual interpretation specifically made a difference to them, as adults visiting with children (see Table 19). The most common reason was that the adults could act as the parents and caregivers they wanted to be, with **adults facilitating the experience for children**:

Grandfather: El otro está bonito pero me parece que uno puede disfrutarlo más aquí porque como digo, hay muchos padres que quisieran llevar a los hijos a un lugar de esos, pero uno quiere explicarle a los hijos o a los nietos lo que están viendo y si no saben el idioma, ¿cómo se lo van a explicar? Aquí tienen la ventaja de que está en español y cualquier padre, cualquier abuelo y se lo explica. Y si el niño o niña quiere leerlo en inglés “ah mira, esto mismo fue lo que me dijeron”. No que si van para otro lugar y me preguntan “Abuelo, ¿qué es eso?”. “Ay, yo no sé”. No entienden

inglés, no es culpa de los padre ni de los abuelos, pero entonces el niño tiene que estar por su cuenta entendiendo y algunas veces no entienden ya ayuda. Uno puede participar con ellos, en vez de nada más estar observando.

Father: The other thing that's good is that it seems like you can enjoy yourself more here; like I say, there are many parents who want to bring children to a place like this, but you want to explain to the children and grandchildren what you're looking at and if you don't know the language how are you going to explain it? Here you have the advantage of it being in Spanish and any parent, any grandparent can explain it. And if the boy or girl wants to read it in English "ah, look, it's the same as they told me." If you go to another place and they ask me "Grandfather, what is this?" - "Ah, I don't know." They don't understand English and it's not the parent's fault or the grandparent's fault but if the child on their part understands and sometimes doesn't understand, I help. Then you can participate with them, instead of just observing.

They also talked about something that commonly comes up when talking to bilingual families about their daily life. Often, the children are bilingual and have to help the parents navigate in an often English-speaking world by translating for their parents. Thus, having bilingual text means that they **don't need to rely on the children to translate the labels:**

Mother: Y no tener que preguntar a tus hijos, porque tus hijos a veces no te van a poder explicar, con su español que ellos tienen no va a o -- o no conocen los términos de cómo decirlo en Español. Muchas cosas no las saben ellos decir en español, entonces no te van a poder explicar y tu te vas a quedar con la duda y no lo vas a disfrutar, realmente no lo vas a poder disfrutar. Puede uno sacar sus conclusiones y lo que uno ya conoce, y el conocimiento que uno trae que bueno te ayuda pero no -- no como ahorita todo te queda claro.

Mother: And you don't have to ask your children, because at times your children aren't going to be able to explain, with their Spanish they don't have – or they don't know the terms or how to say something in Spanish. They don't know how to say many thing sin Spanish, so they aren't going to be able to explain and you're going to doubt yourself and not really enjoy yourself, and the knowledge that one brings that helps but no – not how now everything is clear [with Spanish].

Child: Honestamente lo leí en ingles pero se me hace bien que si esta allí porque igual tengo mucho familiar que hablan puro español y es una hassle traduciendo.

Facilitator: Ah entonces tu papel a veces es de traductora.

Child: Si. La mayoría del tiempo.

Child: Honestly, I read in English but that's fine with me like that because I'm equally familiar with speaking pure Spanish and it's a hassle to translate.

Facilitator: Ah, so your role sometimes is translator?

Child: Yes. The majority of the time. [goes on explaining how she translates the mail for her grandmother at home, and does it so often she gets bored by it]

In addition, they felt more competent in the exhibition because they **knew what to do, and could read instructions themselves**:

Mother: Yo la leo y ellos hacen pero siempre está más en Inglés entonces demoro. Entonces ellos van y yo entre lo que estoy en mi proceso. Y yo les digo, “No, es que es para allá.” Y ellos me dicen, “¿Y cómo sabes?” “Porque yo ya leí.” ¿Entiendes? Pero a veces ellos ya están saliendo de esa atracción, digamos, ¿no? Pero aquí no porque aquí puedo ir paralelo. Paralelo.

Mother: I read it and they do but it’s always more in English so it takes me longer. Then they go and I enter and I’m going through my process. And I tell them “No, it’s there.” And they tell me “And how do you know?” “Because I read it.” Understand? But at times they’re already leaving from the attraction, we say, right? But not here because here I can go in parallel. Parallel.

Table 19. Positive Impact on Adult Experience Sub-Categories, by Site (#)

Positive Impact on Adult Experience sub-categories	San Diego (SDNMH)	Oregon (OMSI)	Miami (MSM)	Houston (CMH)	TOTAL across sites
Can facilitate/teach kids	4	2	9	4	19
Kids not having to translate	7	3	2	2	14
Know what to do/read instructions	1	0	5	4	10
Not have to rely on kids	1	2	1	1	5
TOTAL for each site	13	7	17	11	48

Practicing/Learning Specific Language/Both Languages (46 total codes; 9% of all codes) – One coding category that emerged that was not entirely anticipated in the research was the fact that groups, particularly adults, saw the bilingual interpretation as an opportunity to practice and learn another language (see Table 20). The focus of the adults was particularly on the children, and many of them who had bilingual children talked about how important it was for the **children to increase their ability to speak Spanish**. The children also understood this was important.

Mother: ...buscar su idioma y cuando ve en español yo se que mis hijas hablan ingles y leen pero me gusta porque tienen que poner atención al español y para mi es importante que ellos mantengan su cultura en esa área ¿no? que este en español. Pero siempre los latinos no importa si hablamos ingles siempre buscamos como esa área, sentirnos cómodos con nuestro idioma y sentirnos que somos parte de. ¿Me entiende?

Mother: ...you look for your language and when you see Spanish I know that my daughters speak English and read it but I want them to pay attention to Spanish and for me it's important that they maintain their culture in this area, right? That's in Spanish. But Latinos don't always think it's important to speak English we always look for this, feeling comfortable with our language and feeling like we're part of it. Understand?

Child: Sí, a mí me gusta leer mucho en los dos idiomas para que no me olvide el español porque cuando yo entré en el sexto grado como ya no había más español solamente era en inglés y so para mí ahora quiero leer más en español para que no se me olvide porque ahora no hacemos casi nada en español en las escuelas.

Child: Yes, I like reading in the two languages a lot because I don't want to forget Spanish because when I went into 6th grade there was no more Spanish only English and now I want to read more in Spanish so that I don't forget because now we hardly do Spanish in school.

More generally, the groups talked about Spanish speakers, often adults, as not only having access to content in their own language, but also that it was important for them to be able to **practice and learn English**. They perceived having bilingual interpretation as a way to do that:

Father: Bueno, para mi, es de, trato de leerlo en ingles para mi también entenderlo y cuando lo leo español más o menos lo leo en español para ver si realmente lo entendí en ingles como yo pensé. Entonces por eso yo creo que lo leo en ingles, lo leo en español para que me ayude a mi también.

Father: Well, for me, I try to read it in English so that I am able to understand and when I read it in Spanish more or less I read the Spanish to see if I really understood it in English like I thought. For this I think that I read in English, I read in Spanish to help as well.

Mother: Yo a veces leo en inglés para forzarme un poco a entenderlo. Yo lo leí en inglés pero no lo cogí cien por ciento y entonces lo leí en español.

Mother: Sometimes I read in English to force myself a little to understand t. I read in English but I don't get 100 percent so I [then] read in Spanish.

Again focusing on the children, adults also talked about how being able to **speak Spanish and English was an important advantage for the children**:

Father: Y pero como ellas yo les enseño el español para que no se les olvide, el español, que es muy importante para el futuro de ellas, de que es lo que se dice en ingles y que es lo que se dice en español. Es muy importante para mi que no se les olvide el español.

Father: And for them [children] I teach them Spanish so that they don't forget the Spanish, that's very important for their future, that what they say in English is what they say in Spanish. It's very important for me that they don't forget the Spanish.

Mother: Lo que pasa es que nosotros no queremos que ellos pierdan el español porque tienen más oportunidades, posibilidades en la vida sabiendo los dos idiomas.

Mother: What happens is that we don't want our kids to lose their Spanish because they have more opportunities, possibilities in life knowing the two languages.

Table 20. Practice/Learning Specific Language/Both Languages Sub-Categories, by Site (#)

Practice/Learning Specific Language/Both Languages sub-categories	San Diego (SDNMH)	Oregon (OMSI)	Miami (MSM)	Houston (CMH)	TOTAL across sites
Children learn/expand knowledge of Spanish	6	7	2	4	19
Spanish speakers practicing English	6	2	2	3	13
Advantage for children to be bilingual	3	1	2	1	7
English speakers practicing Spanish	1	1	1	1	4
Parents encouraging kids to practice Spanish	1	1	1	0	3
TOTAL for each site	17	12	8	9	46

Own Language Practices at Home (32 total codes; 6% of all codes) – One of the interview items sought to find out whether the bilingual practices observed in the exhibition reflected what was typical in the home. That is, to what extent are they speaking one or both languages at home (see Table 21). Not surprisingly, given the language requirements for participation in the study, most groups spoke Spanish and English equally at home, with the next most common group speaking Spanish and English equally. There were also some comments made specifically about language practices at home, that were not about the mix of Spanish and English spoken at home. Given that most of the answers in the interviews simply answered the question with one of the categories below, direct quotes are not included for this section.

Table 21. Own Language Practices at Home Sub-Categories, by Site (#)

Own Language Practices at Home sub-categories	San Diego (SDNMH)	Oregon (OMSI)	Miami (MSM)	Houston (CMH)	TOTAL across sites
Mostly Spanish at home	4	3	6	6	19
Spanish and English equally	0	2	3	2	7
Mostly Spanish but trying to practice English	1	0	0	1	2
Some Spanish, but mostly English	0	1	0	1	2
Own language practices at home (general)	1	0	1	0	2
TOTAL for each site	6	6	10	10	32

Group Interaction (24 total codes; 5% of all codes) – One of the categories that emerged related to how bilingual interpretation affected how the groups interacted with each other (see Table 22). The large majority of these codes were about how the bilingual nature allowed adults and other Spanish speakers could **keep up with the rest of the group**:

Mother: Muy importante. Muy importante por la experiencia de que puedo estar a la par de ella.

Facilitator: Entonces pueden compartir la experiencia.

Mother: Se vuelve más bonita, más bonita para estar con ella.

Mother: Very important. Very important for the experience of being able to keep up with her.

Facilitator: Then you can share the experience.

Mother: It becomes more beautiful, more beautiful to be with her.

Mother: Lo hace más fácil para no tener que estar traduciendo y explicando a la otra persona. Y también la otra persona que no habla inglés pues se siente más cómoda de poder disfrutarlo más porque no es lo mismo de estar leyendo y tú mismo estar instruyéndote a que alguien esté traduciendo, que se le pueden ir palabras.

Father: Y tienes otra opción también, cuando tienes inglés hay muchas palabras que son específicas, científicas que en inglés tal vez uno no las conozca y en español uno sí sabe qué significan. Que también esa es otra opción.

Mother: It makes it easier so you don't have to be translating and explaining to the other person. And also if that other person doesn't speak English then they feel more comfortable and can

enjoy themselves more because it isn't the same as reading yourself to be instructing someone who is translating, you can lose words.

Father: And you have another option also, when you have English there are many specific scientific words that maybe you don't know in English and in Spanish you know what they mean. That also is another option.

Table 22. Group Interaction Sub-Categories, by Site (#)

Group Interaction sub-categories	San Diego (SDNMH)	Oregon (OMSI)	Miami (MSM)	Houston (CMH)	TOTAL across sites
Can interact with each other/keep up with the group	3	0	11	6	20
Group interaction (general)	2	1	1	0	4
TOTAL for each site	5	1	12	6	24

Positive Impact on Perception of Institution (22 total codes; 4% of all codes) – There were also comments among the group interviews that having the interpretation be bilingual changed the way they felt about the institution (see Table 23). The most common code was that it made them **felt that the museum cared about them**:

Father: A mí me pareció un lugar muy bonito, impresionante, porque más que nada es como mucho de ciencia pero a la vez lo hace divertido para los niños y fácil de entender para nosotros los adultos también. Y me gusta que hay letreros en inglés y en español. Me hace sentir como que soy bienvenido al museo y de cierta forma me hace sentir como que se están enfocando en mí y que piensan también en nosotros los hispanos, por los letreros bilingües y también porque hay opciones para inglés y español en algunos juegos.

Father: To me it seems like a very good place, impressive, because more than anything how much science [there is] but it's a good time for the children and easy to understand for us adults also. And I liked that the text is in English and Spanish. It made me feel welcome to the museum and in a certain form it made me feel like [the museum] was focused on me and thinks about us Hispanics for the bilingual text and also because there are options for English and Spanish in some games.

Additionally, there were comments about it being **generally inclusive**:

Mother: ...el museo quiere atraer a las personas de habla hispana o sea yo pienso que es algo que tienen que tomar mucho en cuenta, porque pues, la verdad que casi no -- es triste -- pero es la verdad que casi no vienen las personas Latinas a museos y a lugares así y a lo mejor estando el idioma presente se les hace más -- porque también muchas veces si vienen y no entienden lo que están viendo y -- oh pues ¿qué es eso? y o sea -- ay no sabes qué me aburrí ya no vuelvo a venir --

en cambio si esta algo en el idioma pues llama la atención entonces a lo mejor pueden venir con más frecuencia. Y para el museo yo pienso que eso estaría bien porque eso atrae más gente.

Mother: ...the museum wants to attract Spanish speakers, or that is I think that's something they want to take into account, because well, the truth is that almost no – it's sad – but it's the truth that hardly any Latinos come to museums and places like that, and if the language was more present – because also a lot of times if you come and don't understand what you are seeing – well, what is that? Or something – you don't know and you get bored and don't come back – for a change if somethings is in the [Spanish] language well it's calls attention to it and at best they can come for frequently. And for the museum I think that would be good to attract more people.

Lastly, some of the groups said they were **surprised that the text was bilingual**:

Mother: No nos están excluyendo sino que nos hacen parte, se le hace importante más cuando sabemos que hay lugar que muchas areas no van a estar en español pero encontrar tu área en español es como wow.

Mother: They weren't excluding us but making us a part of it, they made us feel more important when we know that there are many areas that aren't going to be in Spanish but you find your area in Spanish is like "wow."

Table 23. Positive Impact on Perception of Institution Sub-Categories, by Site (#)

Positive Impact on Perception of Institution sub-categories	San Diego (SDNMH)	Oregon (OMSI)	Miami (MSM)	Houston (CMH)	TOTAL across sites
They care about me/us	4	1	0	4	9
Are being inclusive generally	1	2	1	2	6
Surprised text was bilingual	2	1	0	2	5
Positive impact on perception of institution (general)	1	0	0	1	2
TOTAL for each site	8	4	1	9	22

Comparison to other Non-Bilingual Experiences (19 total codes; 4% of all codes) – When discussing the affordances of bilingual interpretation, sometimes groups talked about what an experience was like when it was not bilingual (see Table 24). When talking about this the most common code mentioned was the fact that in non-bilingual experiences that the **parent can't engage as well**:

Father: El otro está bonito pero me parece que uno puede disfrutarlo más aquí porque como digo, hay muchos padres que quisieran llevar a los hijos a un lugar de esos, pero uno quiere explicarle a los hijos o a los nietos lo que están viendo y si no saben el idioma, ¿cómo se lo van a explicar?

Father: The other place [children’s museum] was nice but I don’t think you could enjoy it as much because like I said, there are many parents who want to bring their children to these places, but they want to explain to the children what they’re looking at but don’t know the language. How are they going to explain it?

Mother: ...se siente como frustrado por no poder darle una explicación al niño.

Mother: ...you feel frustrated because you can’t explain it to the child.

Additionally, it was also brought up that in non-bilingual experiences the **child often has to translate:**

Mother: Era mi favorita parte, porque hay muchos latinos que quisieran venir acá y como a veces no está en español pues no lo entienden y sólo los hijos y a veces los hijos les dicen a los papás y a veces no. Y también los niños que ya están aprendiendo a hablar los dos idiomas, eso es algo que los padres les pueden decir oh, léamelo.

Mother: It was my favorite part because there are many Latinos who want to come there and at times it isn’t in Spanish so they don’t understand and only the children at times the children say it to the parents and sometimes not. And also the children are learning to speak both languages , that’s something the parents can say, oh, read it to me.

Table 24. Comparison to Non-bilingual Experiences Sub-Categories, by Site (#)

Comparison to Non-bilingual Experiences sub-categories	San Diego (SDNMH)	Oregon (OMSI)	Miami (MSM)	Houston (CMH)	TOTAL across sites
Parent can’t engage as well	1	2	6	1	10
Child has to translate	1	2	2	0	5
Comparison to non-bilingual experiences (general)	0	1	2	1	4
TOTAL for each site	2	5	10	2	19

Code-Switching (11 total codes; 2% of all codes) – There were some instances where groups talked about the fact that they engaged in “code switching” or changing from English to Spanish, or vice-versa, effortlessly during conversation (see Table 25). They talked about this **at specific exhibits:**

Father: Porque si hay una palabras que no sabías cómo decirla o qué significaba y pues la lees en español y ya sabes más o menos.

Carlos: Sí, también eso, te ayuda con unas palabras que no entiendes, ya en español la podías haber escuchado o algo y ya te das una idea.

Father: Because if there are words that you don't know how to say them or what they mean and then you read them in Spanish and more or less know them.

Son: And also that, it helps you with some words that you don't understand, already in Spanish you would have heard or something and that gives you an idea.

As was seen in the exhibits, there were also examples of **code switching during the interview**. Sometimes the code switching happens between sentences, and sometimes within the same sentence:

Mother: Well, it puts everything in perspective because la gente que no sabe ya mirando that exhibition puts everything in perspective. Like oh, wow, if we don't take care of our Earth then where are we going to have our kids, where are the kids going to be. Te pone a pensar. It can be scary.

Mother: Well, it puts everything in perspective because [people don't know looking] that the exhibition puts everything in perspective. Like, oh, wow, if we don't take care of our Earth then where are we going to have our kids, where are the kids going to be. [It makes you think.] It can be scary.

One group discussed why and when they engage in code switching; what determines the language or languages used depended on the mix of individuals in the conversation [this part of the interview conducted in English]:

Facilitator: Yes, when you guys are outside playing together doing your thing, what do you guys do most?

Child 1: We mostly talk English.

Child 2: And then some Spanish and then English.

Child 1: We mix it up sometimes.

Facilitator: Is it fun to mix it up?

Child 1: Yes.

Facilitator: Why do you mix it up because I am curious?

Child 1: Because sometimes we don't know like how to pronounce it.

Facilitator: How to pronounce in English or in Spanish?

Child 1: Like in English.

Facilitator: Okay.

Child 1: Or maybe like if we can mix up with the English word or we forget it or something and we remember it in Spanish so then we say it in Spanish too.

Child 3: I talk Spanish because one of my friends she came from TJ so all she knows is Spanish so we talk Spanish.

Table 25. Code Switching Sub-Categories, by Site (#)

Code Switching sub-categories	San Diego (SDNMH)	Oregon (OMSI)	Miami (MSM)	Houston (CMH)	TOTAL across sites
Code switching practices at exhibit	6	1	1	0	8
In order to express something more clearly	2	0	1	0	3
TOTAL for each site	8	1	2	0	11

Connection to Culture (7 total codes; 1% of all codes) - Besides being a way to practice Spanish, some groups thought that bilingual interpretation was a way for the group to connect to their culture above and beyond the language aspect (see Table 26). These included some **general comments about culture**:

Father: En ese ratito no se me ocurrió porque él estaba en otro juego pero en otra ocasión yo creo que él entendería mejor el sistema de cómo contaban los mayas. O sea, es cultural también. Eso me gustó, es importante. Porque nunca había visto en un museo o en una exhibición que hicieran como juegos divertidos pero involucrando a la cultura de nuestros países.

Father: In this short time it didn't occur to me that he was at another game but on that occasion I believe that he better understood the system the Mayans used for counting. That is, the cultural also. I liked that, it's important. Because I'd never visited a museum or an exhibition that made fun games to involve the culture of our countries.

In addition, a couple of groups thought it was seen as a way specifically for the **children to connect to culture**:

Interviewer: Una de las cosas que dijo que me interesa - el tener la información en español no nada más es sobre poder entender mejor pero también hay un componente que dice que es cultural ¿si nos puede ayudar a entender ese pensamiento?

Mother: Porque yo creo si el hecho que si yo vengo y me pongo a leer en ingles, o sea, y más como por ejemplo los ejemplos que se estaban usando desde como por ejemplo Baja California ¿no? Dices tú, bueno vivo en Estados Unidos yo desde los tres años estoy aquí, entonces

literalmente, o sea, yo nací aquí, aquí he vivido y poco a poco con el tiempo yo he aprendido sobre México y sobre Baja California, que es de mis antecedentes. Entonces, el hecho de también tener la información así, una en el lenguaje, otra que es parte de mis ancestros y la cultura que tiene que ver pues de donde viene uno ¿no? O mis papás. Yo creo que me identifico más así como dice con la cultura, el hecho de que tenga que ver algo contigo, con tu pasado. Y si empieza mucho con la lengua porque al igual como cuando - si yo estuviera trabajando aquí, si hay alguien que quizás apenas está aprendiendo el inglés y se anima a preguntarme, "Oye ¿qué significa esto? O ¿Por qué esto, esto lo otro?" Pero no estaba en español, no pero más o menos lo entendí - o sea, a veces a uno le da pena, no se anima uno a ir preguntar o se queda uno con la duda. Entonces el hecho de tenerlo, pues ahí, yo creo que sí, me identifico mejor, me siento más a gusto.

Interviewer: One of the things you said that interests me – that having information in Spanish is not just about being able to understand better but also there’s a component that’s cultural – can you help me understand this thought?

Mother: Because I think that if I come and am getting to read in English, that is, since the examples that they’re using, for example, Baja California, right? You say, well I live in the United States for three years now, so literally, that is, I was born here I live here and little by little over time I’ve learned about Mexico and Baja California, that is about my ancestors. Then, the fact that you also have the information like that, in one’s language, another is part of my ancestors and the culture that has to do with where one is from, right? Or my parents. I think that I identified more like I say with the culture, something having to do with you, with your past. And it begins a lot with the language because like when - if I was working here, if there is someone who perhaps has just started learning English and gets up the courage to ask me “Listen, what does this mean?” Or, “Why is it this, why is it the other?” But it wasn’t in Spanish, and you more or less didn’t understand – that is, at times its challenging, you don’t get up the courage to ask or you doubt yourself. Then the act of having it, well, I think that yes I identify better, I feel more inclined.

Some of the groups saw language as more than just a way to understand people, but more of **language as an embodiment of culture**, a much more complex and strong connection:

Mother [spoke in English]: Culturally speaking it's more comfortable. The fact that we still sit on our traditions, and we still - I mean, culturally following what our parents used to do. And just like my husband said, it's important for us for them to continue with the language. So, the fact that it's available to something that is probably naturally interesting to them, a topic that's naturally interesting to them, it pulls them to it. I know other people that really like history, that are into it. There is other people that really like books, you know, they look for the information, they research it because they like it. On the other hand, I know my daughters wouldn't just get up and go grab a book or go on the Internet and search. "Oh, I wonder how this is, or I wonder how that is." So, I mean, it brings everything together, yes. Culturally the fact that it is in Spanish, I feel comfortable because I'm thinking, "Cool."

Table 26. Connection to Culture Sub-Categories, by Site (#)

Connection to Culture sub-categories	San Diego	Oregon	Miami	Houston	TOTAL across

	(SDNMH)	(OMSI)	(MSM)	(CMH)	sites
Connection to culture (general)	0	0	0	3	3
Connect children to culture through language	1	1	0	0	2
Language as an embodiment of culture	2	0	0	0	2
TOTAL for each site	3	1	0	3	7

Discussion of Group Interview Findings

Since this research project was exploratory in nature, a deductive approach was used in coding the group interviews that allowed the findings and main categories to emerge more naturally rather than using a pre-existing framework or coding structure. In this manner, the emergent approach would lessen the impact of any possible preconceived notions on the coding and analysis. Given that, to our knowledge, there had not been any major studies of intergenerational Spanish-speaking groups in bilingual science exhibits, we felt that a more deductive approach was not only more appropriate but ultimately would be a better starting point for understanding the phenomena of interest across institutions. While there was an interview guide (see Appendix D) that focused the conversation on specific topics and this certainly impacted groups' responses, the interview itself was more open-ended in order to allow the interviewer to follow interesting topics of conversation that came up naturally during the interview. Therefore, the main coding categories above reflect both aspects of the study covered in previous methods and categories that emerged naturally during the interview.

In examining the main coding categories, there seem to be many affordances provided by providing a bilingual experience to families in exhibits. The most common affordance, not surprisingly, was having access to content, since many of the families were either Spanish-dominant or Spanish-only in terms of their language preferences. Therefore, it was common for the groups, especially the adults, to talk about being able to understand what they were looking at. It is important to note that observation data also indicated, however, that the use of labels was a complex process and that the availability of text in both languages was important in understanding concepts and in better expressing ideas during group conversations.

Being able to access the content, however, was at the core of many of the other advantages to bilingual exhibits that came up. For example, the adults told us that this meant they were able to facilitate the experience for their children, something that English-speaking parents or caregivers may take for granted when visiting science museums. For Spanish-speaking adults having the text bilingual meant they could fulfill their primary role in these education-based institutions, one that should not be underestimated. Even those who spoke some English talked about how it takes them longer to understand then content in English than in Spanish, and if the

children were fully bilingual or English-dominant (which they often were), it enabled them to keep up with the children and not slow the process down. This was especially important as the children tended to read labels less than the adults; so even if the children could function fully with English labels, there is an additional benefit to providing bilingual labels in that group use of the labels would typically increase. It also changed the dynamic between parents and children in that the children didn't need to translate; this was something that multiple children talked about, how they normally have to translate English into Spanish and in the bilingual exhibits they didn't need to. This meant that the parents didn't have to rely on the children to translate, they could fill the role of facilitator for the children, and the children could focus on the meaning of the experience to them, rather than making it meaningful for others. There is ample evidence that providing a bilingual experience in exhibitions has a significant positive impact on not only how the group accesses the content, but also on the interactions and the roles the various group members play.

There were many conversations about how having both languages provided additional opportunities above and beyond simply accessing the content, which included being able to practice or learn other languages. For some adults who were Spanish-dominant or Spanish-only, having Spanish and English side by side provided them an opportunity to practice their English, knowing that they could go over to the Spanish if they ran into a word or phrase they were not as familiar with. Conversely, adults saw the presence of both languages as a way to engage children in Spanish so that they could keep up their Spanish skills, something the parents saw as important not only to the preservation of language and cultural but also as a big advantage for the children. This is consistent with previous research (Garibay, 2004) that suggests this is an important goal for some Latino parents. Rather than Spanish-speaking groups only accessing the Spanish, it seems that there is an emphasis on taking advantage of the presence of both languages.

Given the above, it is not surprising that having bilingual interpretation in exhibitions had a very positive impact on how the groups felt about the experience itself and the institutions. In fact, the category of "positive emotional reaction" was the second most commonly used code, suggesting that the affective reactions were very important when it came to the bilingual exhibit experience. The main emotional affordances of the bilingual experience was that it increased feelings of confidence, being comfortable and enjoyment. Members of the groups also talked about being less frustrated, as a result of the different kinds of interactions mentioned above. The groups not only felt like they could include and being other members of the family, but it helped them feel more included and not excluded by the institutions they were visiting – they felt welcome. These contributed to a number of the groups saying that the inclusion of bilingual text changed how they felt about the institution itself – it made them feel like the museum cared about them. This was especially meaningful to them because they don't often see bilingual text in museums and other visitor institutions, and many groups reported being surprised that the museum had some exhibitions that were fully bilingual.

Main Findings and Implications for Practice

This research provides information about the affordances of bilingual interpretation for Spanish-speaking intergenerational groups visiting science centers. Individuals on the project team had done work in this area with individual institutions. The Bilingual Exhibits Research Initiative looks across institutions, in search of patterns that could be more generalizable. This Pathways Research project is an important first start, and is not definitive of all bilingual experiences in ISE settings. It lays the foundation for systematic study of how bilingual visitor groups and institutions might benefit from bilingual interpretation. Therefore, some of the research implications relate to future research and evaluation.

Below are listed the main findings of the study and implications for practitioners and researchers in the field (see Table 27). One of the main findings had to do with the fact that almost all groups used both English and Spanish, suggesting that it is important to provide bilingual text for groups that speak both languages. There was evidence that providing Spanish text for Spanish-dominant or Spanish-only adults did more than just give them access to content – it allowed them to facilitate the visit with children, provide instructions, allow them to keep up with the rest of the group and encouraged them to feel empowered. Additional positive emotional reactions included feeling welcome, more comfortable and an affinity to the institutions: this suggests that institutions would benefit greatly by providing bilingual interpretation for their Spanish-speaking audiences.

Perhaps the most important finding of the study was that the bilingual experience was more complex than might be thought – that Spanish-speakers don't just access the Spanish content, but both languages. Additionally, there was a lot of code-switching, going back and forth between English and Spanish, that suggests a more dynamic experience for bilingual audiences. Since so little research and evaluation has been done about the bilingual visitor experience, this exploratory study also suggests the need for additional rigorous research and evaluation in this area. Especially given the projected increase in Latinos in the United States over the next couple of decades this issue should only increase in importance, and for museums and other institutions to be relevant to their various communities understanding bilingual experiences is an important step in that process for many groups.

Table 27. Findings and Implications

FINDING(S)	IMPLICATION(S)
<p>Bilingual group behavior - There were nearly double the number of talking behaviors observed as reading behaviors, and adults tended to do significantly more reading than children. Adults often read to assist the children with instructions or explanations.</p>	<p>Adults often take on a facilitator role, so understanding the social aspects of the bilingual experience should be stressed. Content and design decisions may provide adults access to information and instructions in a way that lets them interact with other members of the group, especially children. This will likely increase access and understanding of content, consistent with the role adults were playing with the group.</p>

<p>Spanish/English usage - The large majority of groups used both Spanish and English during their visit, rather than just using one or the other.</p> <p>The degree of Spanish and English varied across the four sites, suggesting there may be regional differences in how bilingual groups engage with Spanish and English content.</p>	<p>Practitioners should examine their perceptions of “Spanish-speaking groups.” We often think of groups as one-dimensional in terms of language: Spanish speakers use Spanish labels, English speakers use English labels. In reality, many groups use both languages, and move fluidly between the two.</p> <p>Each institution using or considering bilingual interpretation should research their particular Spanish-speaking audiences in the community to better understand their language needs and preferences.</p>
<p>Code-switching - (i.e., switching between English and Spanish) was prevalent both when observing groups in the exhibition, and also during the group interviews. Groups reported code-switching to be a common occurrence, especially when there were varying degrees of English- and Spanish-speaking in groups.</p>	<p>Making the complete text available in English and Spanish supports conversational movement between the two languages, for individuals as well as social groups. Further research on code-switching in exhibitions would be useful for understanding bilingual group dynamics and use of language.</p>
<p>Access to content – While access to content was the most common topic discussed during the group interviews, bilingual interpretation has benefits that extend beyond content. There were cultural affordances, including learning Spanish/English or for maintaining connections to culture.</p>	<p>Cultural considerations and other advantages should be included in the conversation about whether to include Spanish text in exhibits. It’s not just about whether a Spanish-speaking group can speak English and access the content that way, but how having both languages changes the experience for the groups, including a sense of welcome and inclusion.</p>
<p>Facilitation for children - Adults were more likely to use the Spanish text than children, who often were more fully bilingual. While the children could translate the labels (lack of Spanish proficiency sometimes interfered with this), parents and caregivers preferred to access the Spanish content on their own, in order to facilitate the experience and keep up with the rest of the group.</p>	<p>Just because the children can translate English text into Spanish doesn’t mean this is a desirable solution for bilingual groups or the institutions. Children talked about being better able to engage bilingual exhibits when they didn’t have to translate for adults. Bilingual text can increase individual access, social facilitation, and learning in the exhibits.</p>
<p>Emotional reactions - There were significant positive emotional impacts to being able to access bilingual text for bilingual groups. These included feeling more comfortable, empowered, valued, and enjoying the experience more. Groups also commented on how the exhibitions being bilingual positively impacted their attitudes towards the institutions.</p>	<p>Bilingual interpretation provides access to content, and engenders positive feelings among Spanish-speaking visitors toward ISE institutions. Many institutions talk about diversifying audiences and reaching out to underserved and underrepresented communities; providing bilingual experiences is a tangible way to achieve some of these goals.</p>
<p>Lack of evaluation - During the interviews with ISE staff, we found that the institutions that were already employing bilingual interpretation were rarely evaluating the impact of the bilingual efforts. Therefore, there is very little rigorously</p>	<p>Institutions employing bilingual interpretation would benefit from evaluating their exhibits with bilingual audiences. In this manner, the field can better understand and more effectively meet the needs of Spanish-speaking audiences. This would also build upon</p>

collected data detailing the specific affordances of bilingual interpretation.	this study's findings, expanding the field's understanding of this increasingly important topic.
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Appendix A

ISE Staff Interview Instruments

Web Survey Questions

1. How long have you been working at your present institution?
2. When did your institution begin to include bilingual (English and Spanish) exhibits?
3. When did you personally do your first bilingual exhibit?
4. Can you estimate how many bilingual exhibitions that you have worked on?
5. What percentage of exhibitions at your institution are bilingual now?
6. What proportion of each current permanent exhibition has bilingual interpretation?
7. What proportion of each current traveling exhibition has bilingual interpretation?
8. Which kinds of exhibit components do you translate regularly? (check all that apply)
 - Text panels
 - Object labels
 - Interactives
 - Videos
 - Audio tour
 - Printed guides
 - Education materials
 - Other (please specify): _____
9. Would you be willing to commit to posting photos and a description of your bilingual exhibition(s) on ExhibitFiles.org?

Interview Questions

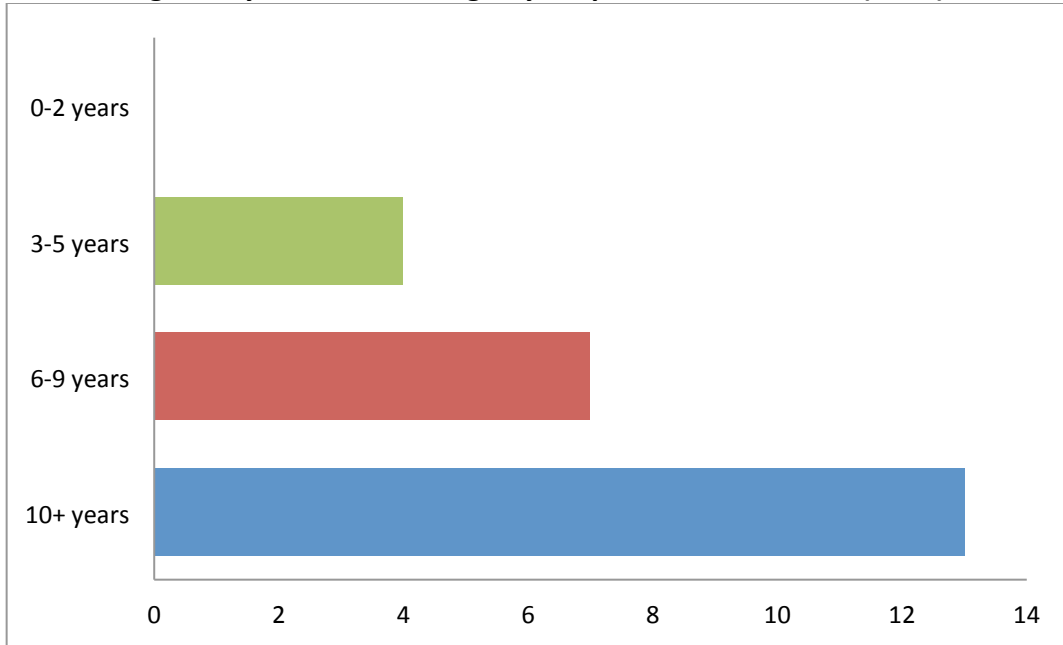
1. How would you describe your institution's philosophy or approach to bilingual exhibits?
2. How did your institution decide to begin presenting bilingual exhibits?
3. How do you create bilingual exhibits? Can you describe your process step-by-step, and explain who is involved?
4. Do you have bilingual staff members, volunteers, an advisory committee, or others that contribute/assist in creating bilingual exhibits? If yes, how?
5. Is there (or was there) a key person who champions the creation of bilingual exhibits?
6. Regarding your bilingual exhibit development process, what do you think works well or doesn't work well?
7. What have you learned in the process of making bilingual exhibits?

8. What do you think are the greatest challenges or obstacles in creating bilingual exhibits?
9. What do you think are the greatest opportunities in creating bilingual exhibits?
10. How do you think visitors use your bilingual exhibits? What do you think they get out of / gain from experiencing your bilingual exhibits?
11. Have you observed visitors, and if so, what have you noticed?
12. How would you describe the present state of your institution with regard to bilingual exhibits? Are you beginning the process, exploring whether or not to present bilingual exhibits and exploring how to produce bilingual exhibits OR do you have full institutional commitment and complete confidence in your expertise OR are you somewhere in between?
(Probe by active listening.)
13. What are some of your remaining questions about bilingual exhibits?
14. In thinking about how we will disseminate this information to the field, what information formats would be most useful or compelling to you? (If time allows)
15. Do you recommend anyone else that we should talk with (i.e. who might have some insight on bilingual exhibits, at your institution or another institution)?

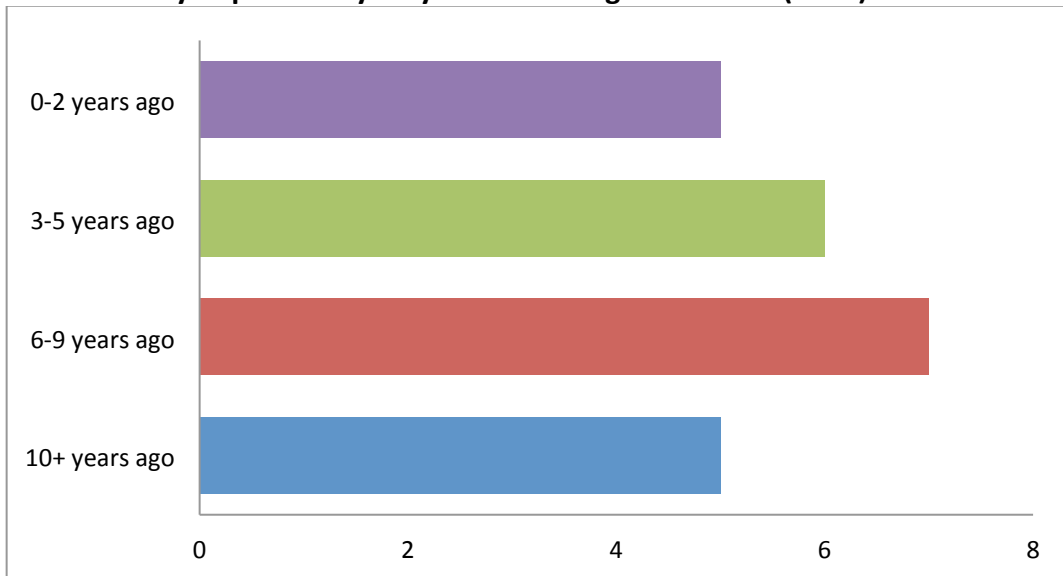
Appendix B

Web-based Survey Questions and Summary Results

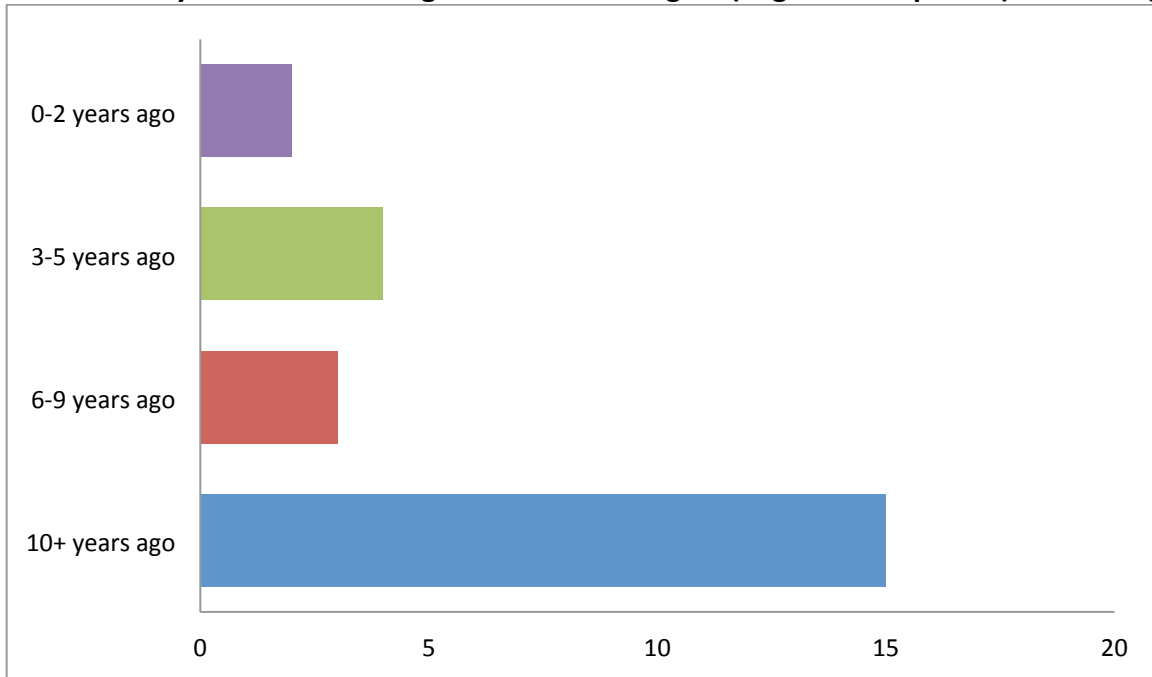
1. How long have you been working at your present institution? (n=24)



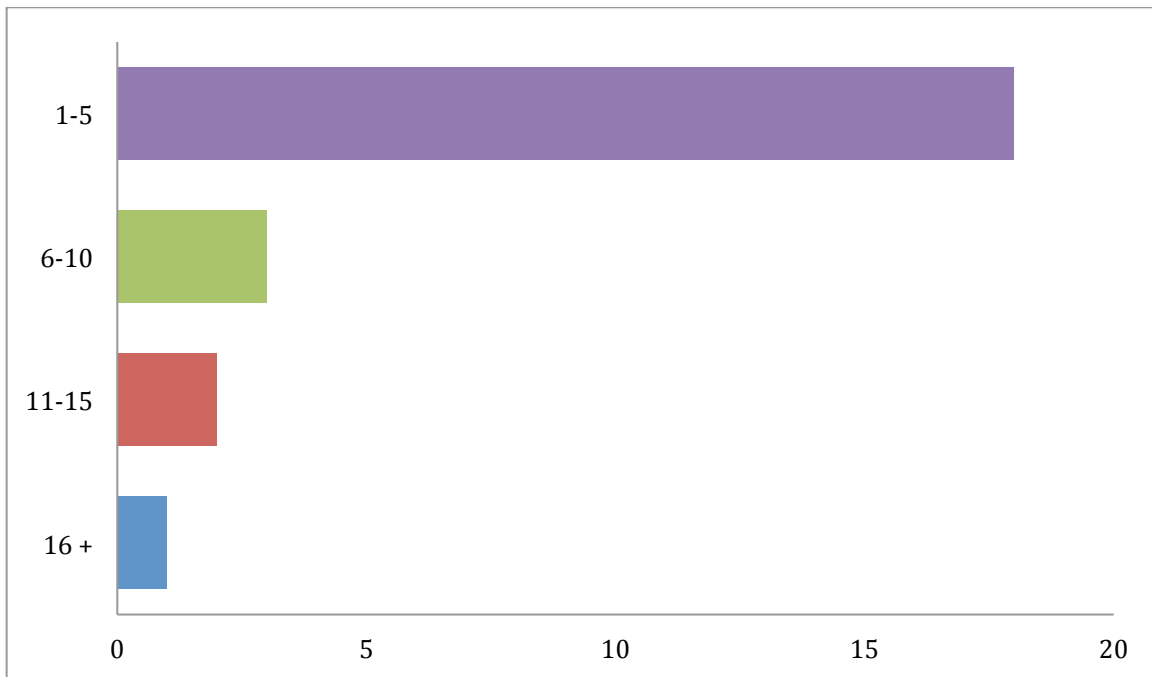
2. When did you personally do your first bilingual exhibit? (n=23)



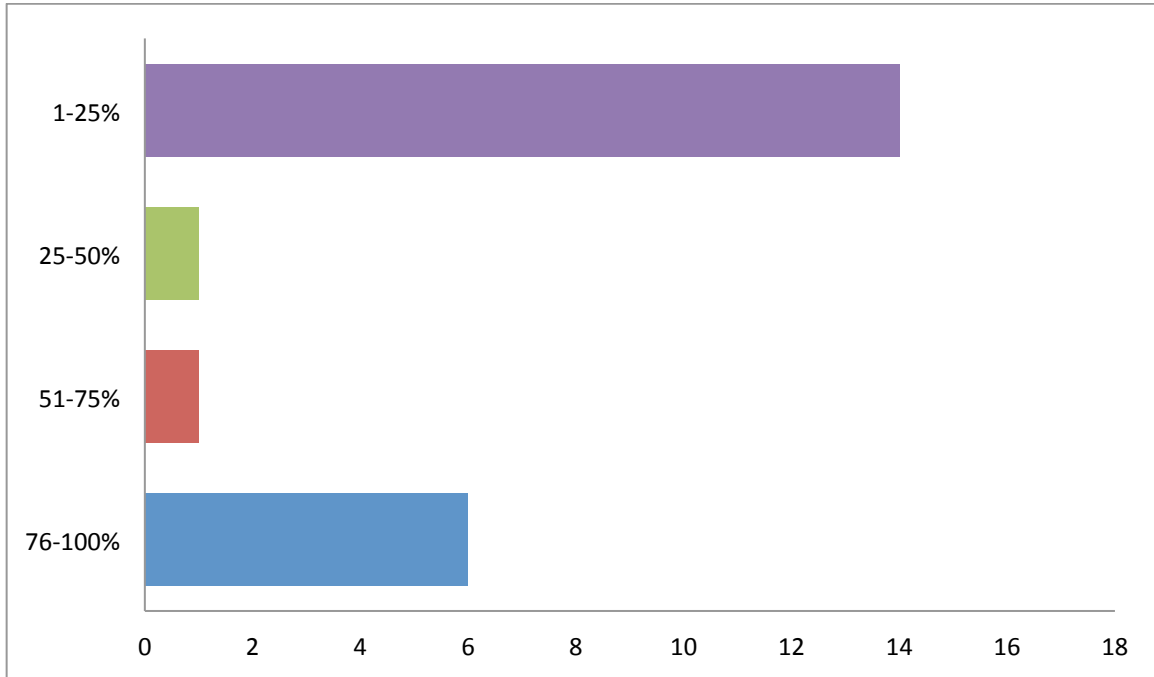
3. When did your institution begin to include bilingual (English and Spanish) exhibits? (n=24)



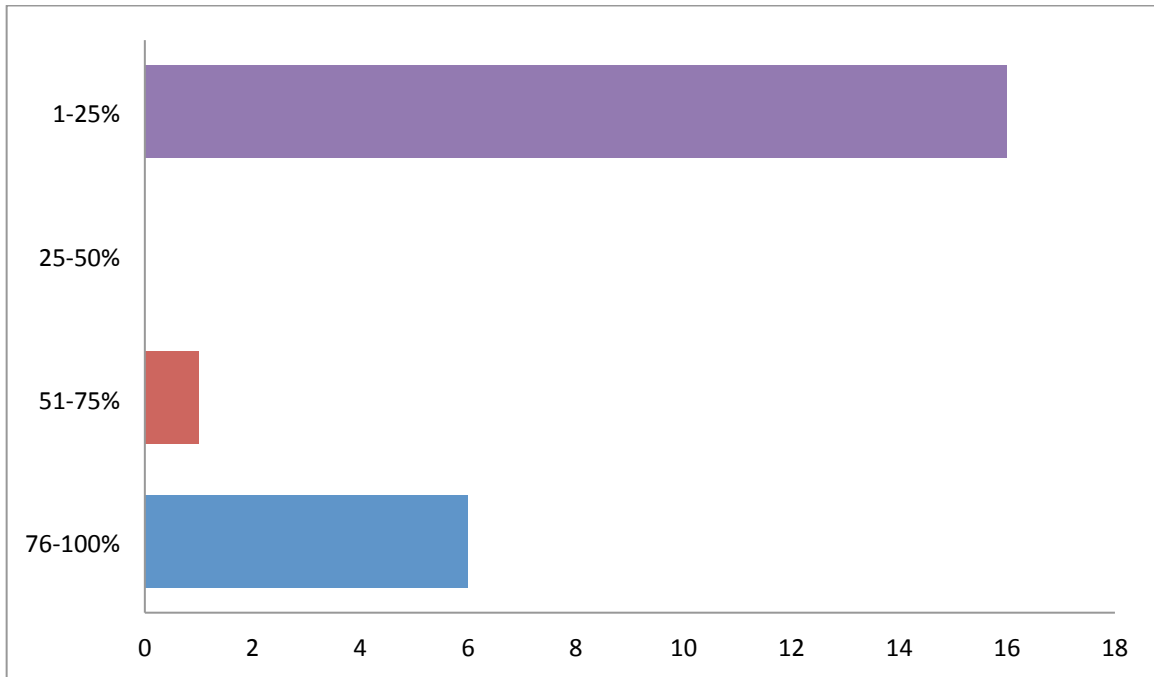
4. Can you estimate how many bilingual exhibits you have worked on? (n=24)



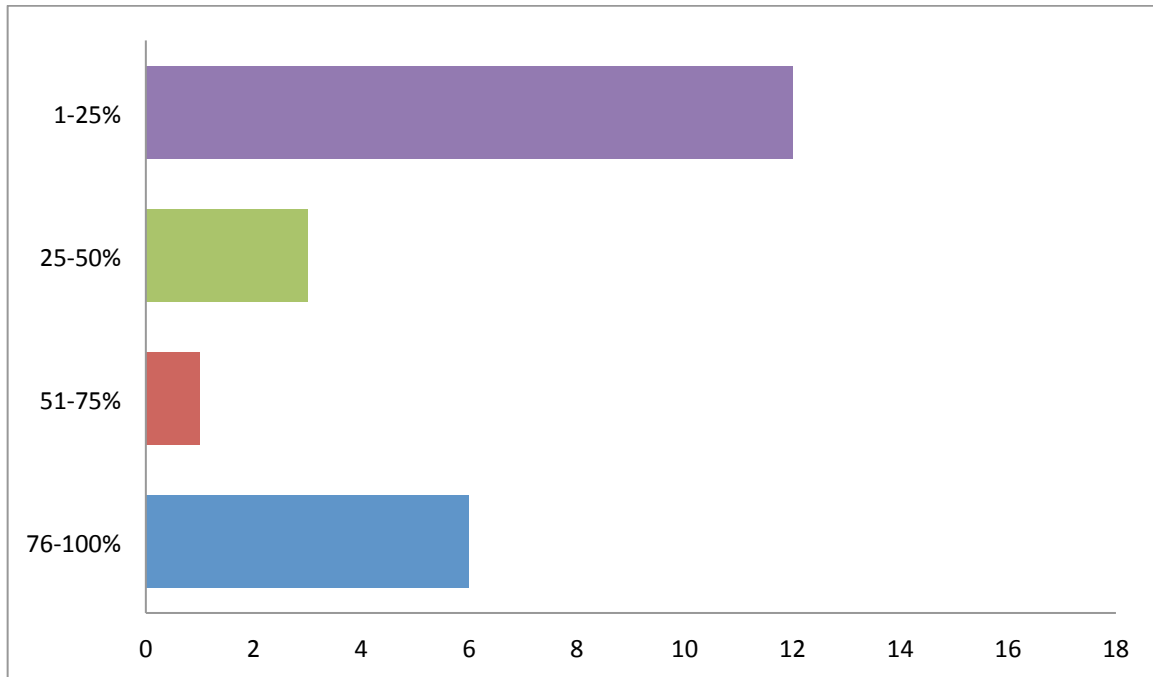
5. What percentage of exhibitions at your institution are bilingual now? (n=22)



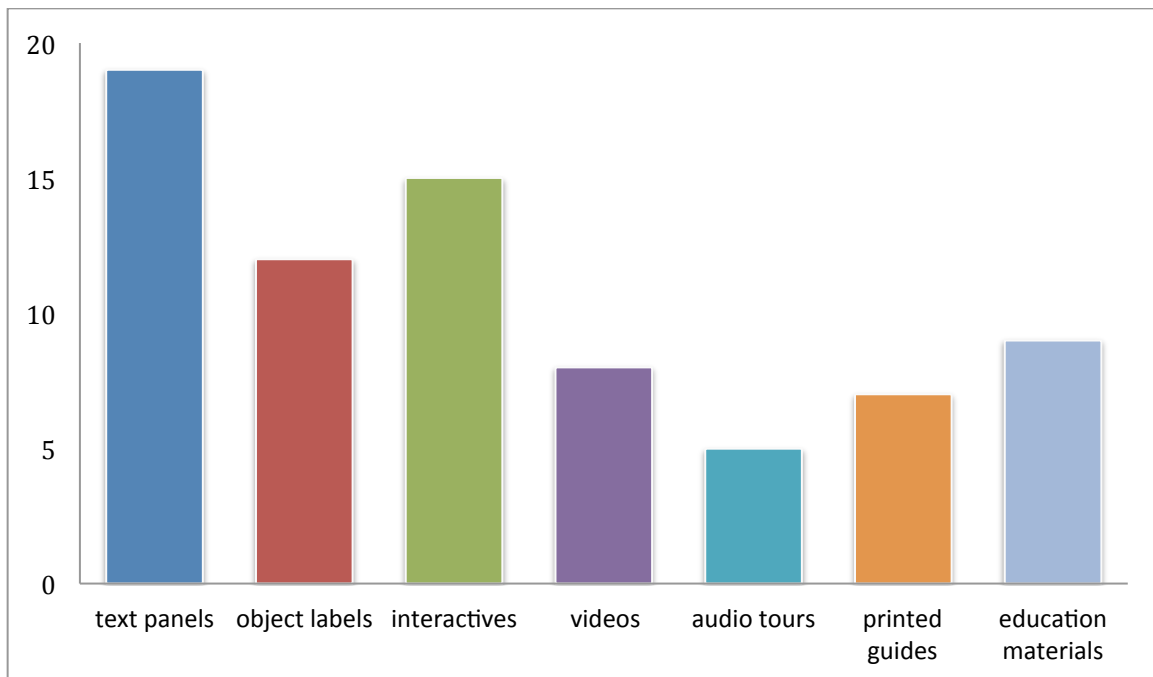
6. What proportion of each current permanent exhibition has bilingual interpretation? (n=22)



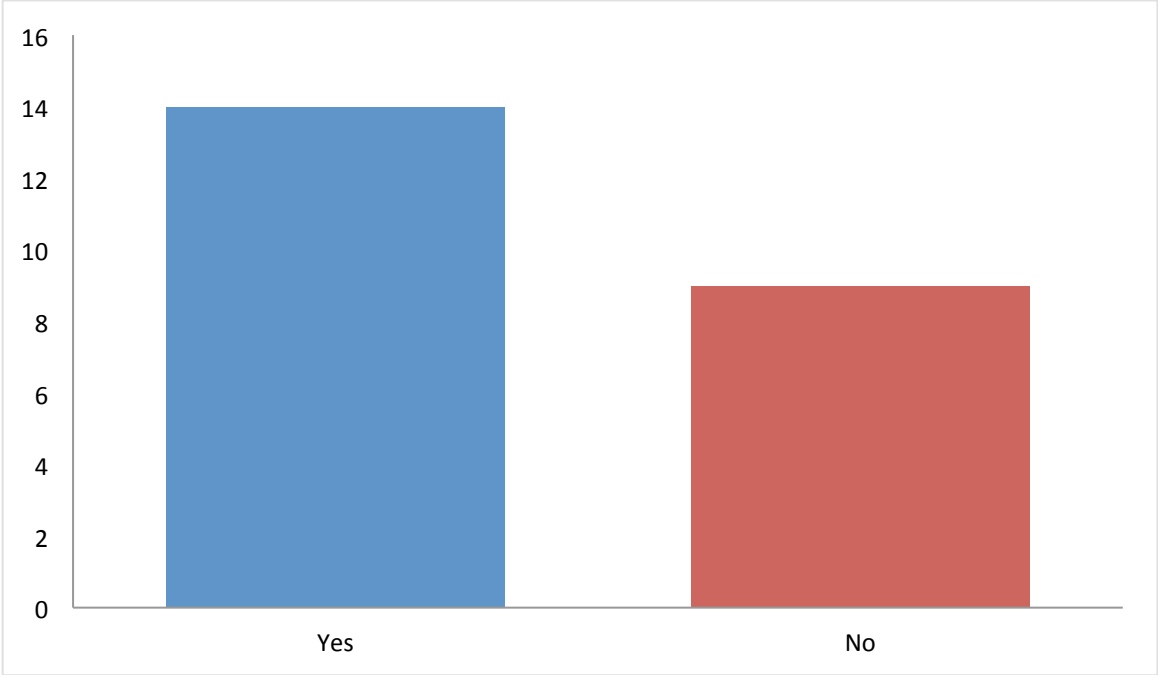
7. What proportion of each current traveling exhibition has bilingual interpretation? (n=22)



8. Which kinds of exhibit components do you translate regularly? (check all that apply) (n=21)



9. Would you be willing to commit posting photos and a description of your bilingual exhibition(s) on Exhibit Files.org? (n=21)



Appendix D

On-site Research Interview Form

Group Interview - English

As I mentioned, your feedback will really help us understand how Spanish-speaking groups experience museum exhibits. It's really important to be honest with us because we need your feedback to make the Museum work for Spanish-speaking families. I don't work for the Museum, so you can tell me anything. Remember, there are no right or wrong answers.

I also want to hear from everyone in the group because you all might have different ideas or things to share. So it's important that you all respond. Think of this as a conversation between all of us. So if I don't hear from you, I might call on you directly so I can be sure to hear from everyone. Okay?

1. Can you share with me your thoughts about the exhibits you just saw? What stood out for you or what did you notice? *[warm-up + see if they mention bilingual. Be sure to probe to get full articulation of everything they notice. Can probe with: "anything else?"]*
2. Thinking about the exhibit you saw, please complete the following sentence: "I never realized that..."

Probes:

- Was there anything you didn't know about before?
- Were any topics or information brand new for you?

3. Would you say you felt very comfortable when using the exhibits?

Probes:

- What aspects of the exhibit made you feel comfortable?
- Was there anything that did not help you feel comfortable?

4. What did you think about the fact that the information in the exhibit was in both English and Spanish? *[If haven't mentioned bilingual, rephrase this way: "Did you notice that the information in the exhibit was in both English and Spanish? What did you think about that?"]*

5. Did it make any difference to you that the information was available in both English and Spanish?

Probes:

- How did it affect your experience?
- How, if at all, do you think your group benefited from it being in two languages?
- Were there any ways in which you think having information in both languages negatively affected your experience?

6. I want to hear about the way you experienced the exhibit as a family. Would you say the way you interacted with each other was pretty typical for your family or not?

[Use “I noticed that...” prompts to tease out if certain behaviors noted were typical for group]

Probe:

- How, if at all, did having information in both Spanish and English affect the way you interact with each other?

7. Were there any specific parts of the exhibit that worked particularly well for you, as a group with Spanish speakers? [If Yes] Which part(s) were those, and why?

[Use “I noticed that...” prompts to more fully investigate this question based on observations of where they spent a lot of time at or where interactions seemed especially rich]

8. Were there any particular parts of the exhibit that you think do not work so well for Spanish speakers? [If Yes] Which part(s) were those, and why?

[Use “I noticed that...” prompts to more fully investigate this question based on observations of where they spent little time at or where there were cursory interactions.]

9. When you looked at the content or labels, would you say you read it more in Spanish, more in English, about equally, or did you read only one language?
 - a. [Anything but b) Only in English] Can you tell me a little bit about how you went back and forth, or not, between the English and Spanish?

[Use “I noticed that...” prompts to more fully investigate this question based on observations of how you observed them using bilingual information.]

10. Have you seen any other bilingual exhibits in museum before today? [If Yes] How does this museum’s bilingual exhibit compare to the other one(s) you’ve seen?

11. Thinking back on your experience in the exhibit, was there anything that you could relate to, that had something to do with you, your life, what you do?
12. How important do you think it is for the museum to include information at their exhibits that is in both English and Spanish?

Probe:
 - Tell me the reasons you think it's important.
 - <If say not very important> Tell me why you think it's not important
13. What suggestion do you have for the museum to improve the exhibits for Spanish speakers? What could they include or do differently to make it a better experience for a Spanish-speaking group like you?
14. Do you have any other comments about your experience as Spanish speakers in the exhibit, that we didn't already cover?

Thank you very much for your time. It will be very helpful for not only this museum but for other museums to improve exhibits for Spanish-speaking groups like you.

Group Interview - Spanish

Como ya lo mencioné, su retroalimentación nos ayudará a entender la experiencia de los grupos que hablan español en las exposiciones en los museos. Es realmente importante que sean honestos con nosotros porque necesitamos su retroalimentación para hacer que el Museo funcione para familias que hablan español. Yo no trabajo para el Museo, así que pueden hacerme cualquier comentario. Recuerden que no hay preguntas correctas ni incorrectas.

También quisiera escuchar los comentarios de cada miembro del grupo porque todos podrían tener diferentes ideas o cosas que compartir. Así que es importante que todos respondan. Piensen en esto como una conversación entre todos nosotros. Así que si no escucho su comentario, podría llamarlo directamente para asegurarme de escucharlos a todos. ¿Entendido?

1. ¿Puede compartir conmigo sus opiniones sobre las exposiciones que acaba de ver? ¿Qué fue lo que más le llamó la atención o qué observó? *[ejercicio de calentamiento + vea si mencionan la parte bilingüe. Asegúrese de hacer una buena exploración para obtener una amplia perspectiva de todo lo que observan. Puede hacer la exploración con: "¿algo más?"]*
2. Pensando en la exposición que vio, complete la siguiente oración: "Nunca me di cuenta que..."

Preguntas exploratorias:

- ¿Hubo algo que no supiera anteriormente?
- ¿Hubo algún tema o información nueva para usted?

3. ¿Podría decir que se sintió muy cómodo cuando visitó las exposiciones?

Preguntas exploratorias:

- ¿Qué aspectos de la exposición le hicieron sentir cómodo?
- ¿Hubo algo que no lo ayudó a sentirse cómodo?

4. ¿Qué le parece el hecho de que la información en la exposición estaba tanto en inglés como en español? [Si no mencionó la palabra bilingüe, reformule la pregunta de esta manera: “¿Se dio cuenta de que la información de la exposición estaba tanto en inglés como en español? ¿Qué le pareció esto?”]

5. ¿El hecho de que la información estuviera disponible tanto en inglés como en español significó alguna diferencia para usted?

Preguntas exploratorias:

- ¿Cómo afectó esto su experiencia?
- ¿Cómo, de ser así, piensa que su grupo se benefició de que estuviera en dos idiomas?
- ¿Puede usted de alguna manera pensar que tener la información en ambos idiomas afectó negativamente su experiencia?

6. Quisiera escuchar sobre la manera como experimentó la exposición en familia. ¿Diría usted que la manera como interactuó con todos los demás fue bastante típica para su familia o no?

[Utilice notas como “Observé que...” para aclarar si ciertos comportamientos observados fueron típicos de grupo]

Pregunta exploratoria:

- ¿Cómo, de ser así, tener información tanto en español como en inglés afectó la manera como usted interactuó con los otros?

7. ¿Hubo alguna parte específica de la exposición que funcionó particularmente bien para usted como grupo con personas que hablan español? [En caso de ser afirmativo] ¿Qué parte (s) fue (fueron) y por qué?

[Utilice notas como “Observé que...” para investigar más ampliamente esta pregunta basado en observaciones sobre dónde pasaron mucho tiempo o dónde las interacciones parecieron especialmente efectivas]

8. ¿Hubo alguna parte en particular de la exposición que considera que no funcionó muy bien para personas que hablan español? [En caso de ser afirmativo] ¿Qué parte (s) fue (fueron) y por qué?

[Utilice notas como “Observé que...” para investigar más ampliamente esta pregunta basado en observaciones sobre dónde pasaron mucho tiempo o dónde hubo interacciones superficiales.]]

9. Cuando miró el contenido o las etiquetas, ¿diría usted que las leyó más en español o más en inglés, más o menos igual, o leyó sólo en un idioma?
a. [Cualquiera menos la b) Sólo en inglés] ¿Puede contarme un poco sobre cómo pasó, o no, de un idioma a otro entre inglés y español?

[Utilice notas como “Observé que...” para investigar más ampliamente esta pregunta basada en observaciones de cómo notó que utilizaban información bilingüe.]]

10. ¿Había visto alguna otra exposición bilingüe en museos antes de hoy? [En caso de ser afirmativo] ¿Cómo se compara esta exposición bilingüe de museo con otra (s) que haya visto?

11. Volviendo a su experiencia en la exposición, ¿hubo algo con lo que pudiera usted identificarse?, ¿algo que tuviera que ver con usted, su vida o lo que hace?

12. ¿Cuánta importancia considera usted que tiene para el museo incluir información en sus exposiciones que sea tanto en inglés como en español?

Pregunta exploratoria:

- Dígame las razones por las que considera que es importante.
- <En caso de decir que no es muy importante> Dígame porqué cree que no es importante

13. ¿Qué sugerencias tiene para que el museo mejore sus exposiciones para personas que hablan español? ¿Qué podría incluirse o hacer de manera diferente para hacer de ésta una mejor experiencia para los miembros de grupos de personas que hablan español como usted?

14. ¿Tiene algún comentario adicional sobre su experiencia en la exposición como personas que hablan español, que aún no hayamos abordado?

Muchas gracias por su tiempo. Será muy útil no sólo para que este museo sino para que otros museos mejoren las exposiciones para grupos de personas que hablan español como ustedes.