Voces de Esperanza

Exhibit Development Preliminary Framework:

A synthesis of ambitions, theory, and evidence

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Acknowledgments

We gratefully acknowledge the contributions of the *Voces de Esperanza* project partners: AB Cultural Drivers, Adelante Mujeres, and members of the Colaborativo Comunitario. We extend our gratitude to all the individuals who volunteered to participate in the formative evaluation study. And we thank Voces project team members from OMSI, including those individuals who helped welcome families to the museum during the formative phase. Also, we thank OMSI staff members who helped develop, build, and move prototypes, and who helped with data entry, analysis, editing, and reviewing. Without all of you, these insights would not be possible.

Study background

This study is named the *Voces de Esperanza Exhibit Development Preliminary Framework: A synthesis of ambitions, theory, and evidence*. OMSI co-led this project with AB Cultural Drivers (ABCD) and Latine audiences, using a community-based participatory, culturally and linguistically-specific (Spanish/English) approach in the project design and evaluation. Collaboration with community partner, Adelante Mujeres, secured the engagement of Latine audiences through a Colaborativo Comunitario/Community Collaborative (Colaborativo) to work toward co-creating exhibit experiences and evaluation that would result in a framework of practices (the processes used in the Voces project) (Herrán et al., 2025) and a framework of exhibit strategies and practices that support the focal audience's skills in having conversations about climate change, actions, and solutions in their communities and everyday lives. This exploratory, qualitative study is one step in the development of a project deliverable, an Exhibit Development Framework, within a larger exhibit development project. The project and intended Exhibit Development Framework deliverable are described in the section below. Further sections describe the study goal, exhibit prototypes, methods, results, a preliminary framework for further iteration, and commentary.

Voces de esperanza/Voices of Hope (Voces): An Exhibit and Framework for Talking about Climate Change is a project that was initially funded by the National Science Foundation (NSF) and later by the Spencer Foundation. *Voces* sought to broaden participation in climate conversations and action through iterative development of an exhibit experience intended to study content and design strategies for Latine audiences. When first funded and launched in the Fall of 2023, the project was expected to run for three years and result in four main deliverables:

1. A 500–800' bilingual interactive exhibit experience with a focus on climate change conversations
2. An exhibit development framework for engaging Latine visitors
3. Text and video legacy documents for museum practitioners around collaboration
4. Text and video legacy documents for the public telling the story of exhibit creation

However, in April of 2025, two years into the project, Voces was affected by a large-scale governmental defunding strategy and the project was terminated. This meant that many activities were incomplete and unable to move forward to fully achieve the project deliverables. Progress made before the termination, included near completion of schematic design of the exhibit co-informed by the project partner and Latine community members, some professional development and dissemination opportunities, data collected for process evaluation, and near completion of the prototyping phase.

Through support from the Spencer Foundation, the Voces team, particularly OMSI Evaluation and R&D staff were able to move forward this study by relying on the prototype phase (also known as formative evaluation) data that emanated from members of Latine communities and general museum visitors who interacted with Voces prototypes. This study is a first step of a more generalized framework to guide the development of unfacilitated exhibits for fostering climate change conversations among visiting families from Latine communities.

The Voces project proposal authors stated one of the Voces deliverables as:

> "An evidence-based exhibit development framework for engaging the culturally and linguistically specific focal audience of Latine and Spanish-speaking visitors. This framework will outline practices and exhibit strategies for supporting visitors' awareness and skills in having conversations about climate change."

In the process of creating and drafting the Voces Exhibit Development Framework, the project team was expected to rely on these strategies:

- Iterative development of an exhibit experience to study content and design strategies;
- Previous knowledge related to climate change conversations and exhibits, including strategies for climate change conversations from the National Network for Ocean and Climate Change Interpretation (NNOCCI) (Geiger et al., 2017), *A Climate of Hope* (Natural History Museum of Utah, 2023), and other climate communication research (e.g., Yale Program on Climate Change Communication, Roser-Renouf et al., 2021; Hayhoe, 2018).

Building from the strategies above and what was learned from developing the original proposal to the National Science Foundation, the OMSI evaluation team conducted further literature review in these areas:

- Previous knowledge related to conversations at exhibits
- Previous knowledge related to intercultural communication (including stories and metaphors)

Due to the scope of this initial study and where the project team was in the progress of the deliverables, particularly the exhibit prototype development, the OMSI evaluation team focused on exhibit design strategies and not on exhibit design practices nor in-depth

exhibit content. This meant that at the time of this study, insights and recommendations provided by the Colaborativo and Adelante Mujeres staff with respect to the Exhibit Development Framework were nascent and not fully fleshed out in the exhibit prototypes' activities and content. An OMSI evaluation staff member who self-identifies as a bilingual, Spanish/English speaker and Latina served as project core team member and evaluation co-lead; as part of these roles, she co-led this study and preliminary framework.

At the beginning of the study, the project team found it useful to create a theory of action to organize ideas around exhibit outcomes, exhibit characteristics, and contributing theories. It was from this conceptualization that an Exhibit Development Framework would emerge. The OMSI evaluation team realizes some terms are not independent, but they are key to prepare the reader for this study's role in a larger process. To prepare for reading this study, here are three terms used and that need to be distinguished:

- Theory of action: This term refers to the intention to select and organize robust content that is usable by exhibit development teams. That is, the material in the Framework synthesizes inputs such that museum practitioners can see practical, theoretical, and empirical guidance to inform their exhibit design, evaluation, and improvement decisions. The theory of action could evolve as practitioners and museum professionals use it and address their study of exhibit design and experience. From now on, the use of Framework or Exhibit Development Framework will refer to the structured realization of the theory of action.

- Exhibit Development Framework (and Framework): This term refers to the structure and visualization of the schema (theory of action) that is being created. The reader will see it evolve below in the form of a table. This term also refers to one of the deliverables expected in the Voces project. From now on, this definition will be referred to as either Framework or Exhibit Development Framework.

- Preliminary Framework: This term refers to the status of the Framework presented at the end of this study. That is, this study is reliant on the inputs available at the time of this synthesis. Given that no prior draft of a framework existed, the OMSI evaluation team believes the results of this study offer evidence strong enough to provide a starting point for a framework, but cannot support the development of a full-fledged version 1. This Preliminary Framework will inform conversations about future inputs and evolutions of the Framework.

Voces Exhibit Development Preliminary Framework Study goal

The goal of this study was to create an evidence-based framework of exhibit characteristics that support the logic model outcomes (see Exhibit Outcomes section of this report pages 9–10 and Appendix A). Given the project ambitions identified in the proposal, of particular interest is evidence of exhibit characteristics that support the practice of climate conversations in ways that resonate with Latine and Spanish-speaking bilingual families and groups. For this, OMSI evaluation staff reviewed data sets from the exhibit formative evaluation phase that occurred from October 2024 to January 2025, producing insights from participants' self-report and data collectors' observation of participants with respect to the Voces exhibit prototypes. Additionally, this report relied on theories compiled by Voces project team members, including constructs from the intercultural communication field. This is an exploratory, qualitative study and synthesis to inform the Voces team, or other exhibit developers, to continue to experiment with and evolve exhibit practices and content and design strategies.

Furthermore, this effort progressed through practices and lenses toward cultural and linguistic relevance for Latine and Spanish-speaking bilingual groups. To get through this work, contributing theories from the literature review, would act as conduits for building the Framework. These theories would need to be reflected and vetted in the form of practices by the Colaborativo, Adelante Mujeres staff, and Latine and Spanish-speaking bilingual families to refine and inform exhibits strategies in support of the outcomes. The depiction offered in Figure 1 is a road map of the process of crafting and refining the Framework as envisioned by OMSI evaluation staff. This study is situated in the Proposed Framework developed stage (see first column to left in Figure 1) and, therefore, the content articulated here is about that stage in the process.

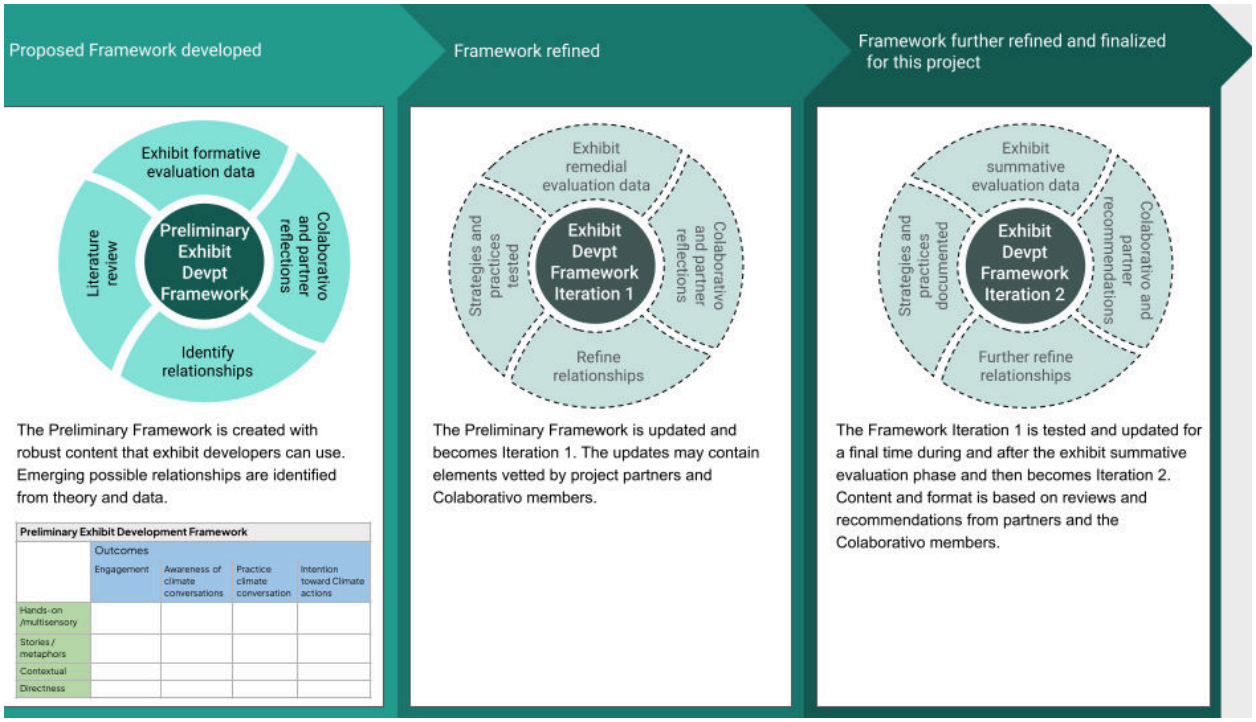


Figure 1. Process roadmap incorporating theory and evidence in service of the Exhibit Development Framework.

The following overarching question is the compass of this study's process roadmap:

> What exhibit approaches effectively support Latine and Spanish-speaking visitors' awareness of the need for public discourse and exercise of skills for climate change conversations in their communities and everyday lives?

In creating this synthesis,OMSI evaluation staff relied on a number of assumptions.

1. Applications of intercultural communication theories can support Latine and Spanish/bilingual speaking groups to practice climate conversations in an unfacilitated exhibit context.
2. Exhibit characteristics such as the type of activity and design of labels can influence participants' behaviors.
3. English-based free-choice learning strategies, communication, and activities focused on climate change can be expanded and adapted for Spanish-speaking and bilingual audiences.

Along with the assumptions, priority was given to the information observed and reported from Latine and Spanish-speaking bilingual families and groups in relation to Voces exhibit

characteristics that could be supportive of climate conversations among participants. The sections below, Exhibit characteristics, Exhibit outcomes, and Theories and constructs, describe how the information from families and groups might be organized to show relationships between exhibit characteristics, behavioral outcomes, and design-related theories.

Exhibit characteristics

The term exhibit characteristics is commonly used to refer to the content, activities, copy, and design of an exhibit. These characteristics are also referred to as attributes. In exhibit research, characteristics are often proxies for affordances. Affordances are exhibit characteristics that invite or foster particular behaviors (including verbalization) from groups and families who interact with that exhibit (Gibson, 1979; Norman, 1988, Allen et. al, 2004). OMSI evaluation staff did not look at the environment in the form of affordances, but rather at characteristics that were present in the Voces exhibit prototypes. For the purposes of this report, the term characteristics or attributes will be used to describe the content and physical elements of the exhibit prototypes.

For the Framework, the exhibit characteristics are conceived as iterations of the physical elements of the exhibit prototypes that have not achieved their final shape. Yet, accompanied by contributing theories, these characteristics could influence the extent to which the outcomes are met.

Exhibit Development Framework				
	Outcomes			
	Engaged, relevance and belonging (connective and affective)	Aware of climate conversations as climate action (cognitive)	Practice climate change conversations (skills)	Intention toward Climate change actions (skills and affective)
Hands-on/multisensory				
Stories/metaphors				
Context				
Directness				

Figure 2. Exhibit Development Framework for climate conversations at exhibits for Latine and Spanish-speaking bilingual families and groups

Exhibit outcomes

Five exhibit outcomes were identified in the exhibit logic model (see Appendix A) that accompanied the proposal material. These outcomes prioritized the summative evaluation phase and were iterative in nature, meaning they were expected to evolve as the Voces team members refined and evolved their project goals. OMSI evaluation staff reviewed these outcomes and synthesized them in a way (see Figure 3 below) that could guide the the Exhibit Development Framework (see the column headers in Figure 2):

Outcome	Outcome description
Engagement	This outcome includes ways in which the topic of interest, in this case climate change, can be relevant and engaging, fostering a sense of belonging for participants when having conversations.
Awareness of climate conversations	This outcome is aligned with Swim, Fraser, & Geiger (2014): "... *members of the public* need more than alarming facts and dire predictions. *They need tools for having solutions-focused conversations that advance public discourse, foster hope for the future, and move individuals toward collective action."* The Voces hands-on exhibit activities could foster behaviors that elicit awareness of solution-oriented climate change conversations by providing opportunities to perform actions among participants. This is as long as exhibit activities and characteristics respond and resonate with Latine and Spanish-speaking bilingual families.
Practice climate conversation	The team's working understanding of climate conversations was guided by the knowledge and strategies from several researchers and climate change science and climate change communication, including Katharine Hayhoe. Hayhoe, a climate change scientist, suggests climate conversations can be distilled into three core steps: finding a common interest or value with someone (with whom one is to have a climate conversation), connecting that value to climate change, and talking about solutions. This last step includes collective solutions (Hayhoe, 2024).

Intention toward climate action	Since climate action may not be possible at the exhibit, the exhibit is designed to elicit the intention to act during and after engaging with the exhibit prototypes. This is indicated when participants verbalize potential climate actions they can do as individuals and/or communities.

Figure 3. Exhibit outcomes and their descriptions

Theories and constructs

For this exploratory study, OMSI evaluation staff conducted a literature review and an inventory of what had already been selected as theories and constructs that could inform the project learnings and deliverables.These theories were organized in the form of categories that could guide exhibit characteristics in support of the Exhibit Development Framework. The categories that describe each of the constructs and contributing theories are named in each of the rows (see Figure 2); in brief these are Hands-on/multisensory, Stories/metaphors, Context, and Directness.

Theories related to exhibit experiences, and the ways experiences foster engagement and learning, inform museum practitioners' choices for how to engage participants, such as choosing to create table top activities or full body immersion (e.g. Dancstep et al., 2015). From the assumption that hands-on and multisensory exhibit characteristics support group and family engagement, the OMSI evaluation team included theories aligned with characteristics that could foster verbal communication among participants at exhibits. Similarly, from assumptions that intercultural communication theories may resonate for the Latine and Spanish-speaking bilingual groups and could foster connections at exhibits, these theories are also included in this study.

The first row of the Framework, **Hands-on/multisensory** (see Figure 2)**,** aligns with prior research on conversations at exhibits and in intercultural communication. The idea that hands-on exhibits and multisensory experiences promote family conversations has been supported by many authors. Research proposed by Callanan et al. (2017) suggests that hands-on activities that are immersive and provide imaginative settings, inspire scientific meaning-making conversations among parents and and children. In a similar vein, some authors who researched immersive exhibit design, suggest that these experiences could be effective when they include apparent metaphors and storytelling within their activities (Mortensen, M. F, 2011; Popoli & Derda, 2021). The hands-on exhibits construct also ties well with a topic in intercultural communication, the "task and the person." This theory states that American culture tends to perceive communications related to tasks as separated from the person and with the priority on completing the task (Storti et al., 1997). However,

there are many cultures for whom the task and the person are not separated, and the relationship precedes the task (Storti et al., 1997).

Storytelling and metaphors as a communication approach has been used in free-choice learning environments. Yet, when considering storytelling, the topic and content are important layers that could inform the characteristics in exhibits. Climate Outreach (2021) proposes that practitioners (communicators, content creators, etc.) go beyond traditional stories, familiar metaphors and mainstream imagery elements (e.g., the polar bear image) when communicating about climate change. To support alternative images in the public mind they suggest moving towards new stories about climate change that are less known and more thought provoking. By making use of these suggestions, images, metaphors, and stories could be crafted to better resonate with diverse audiences.

The roles of **Context** and degree of **Directness** (Figure 2) refer to two constructs that are mentioned in intercultural theories and related works (Office of Minority Health, U.S. Department of Health & Human Services., n.d.; Storti et al., 1997). These constructs are each perceived as a spectrum. Directness is a continuum of direct to indirect communication, with direct meaning that what is said is meant at face value and has no implicit meaning. On the other hand, indirect means that the meaning is implied in something that is said. Likewise, context ranges from low to high, with low context often part of cultures that tend towards individualism and use words as the primary way to convey a message. On the other side of the spectrum is high context, which means that verbalization of messages is not the primary way to communicate; on this side, a lot of the content is implied and it relies on non-verbal language and inferences. Some authors argue that the culture can influence the degree to which these constructs are positioned in each of their respective spectrums. Usually, what authors suggest is that the culture in the US, due to the individualistic approach and heterogeneous nature, tends to be low context and more direct, meaning that Americans tend to rely more on words, be explicit, and take words at face value (Office of Minority Health, U.S. Department of Health & Human Services, n.d.; Storti et al., 1997). By considering context and directness, exhibit characteristics could be designed to better resonate with the Latine audiences.

Descriptions of exhibit prototypes

The Voces exhibit prototypes were developed to support Latine and Spanish-speaking bilingual visitors' (youth in grades 6–12 and their families) awareness of the need for public discourse and skills for engaging in climate change conversations. The prototypes were built on strategies used in *A Climate of Hope*, an exhibition built at Natural History Museum of Utah (NHMU) (Natural History Museum of Utah, 2023). *A Climate of Hope* engages visitors in climate science within a framework of rational hope for the future (Thompson, L.,

2022). For the Voces project prototyping, five bilingual exhibit components were built and installed at OMSI from August 30, 2024 to January 10, 2025.

Prototyping consisted of two main iterations preceded by a shakedown period (September through mid-October of 2024) that allowed the OMSI exhibit team to observe and make quick updates to the exhibit prototypes before formal data collection began. Iteration 1 went from October 26 to December 3 of 2024. This iteration included the Family Science Night (FSN) event that occurred on November 12, 2024. Iteration 2 occurred between December 20, 2024 to January 4, 2025. Both iterations included the same five exhibit prototypes. The descriptions and images below (See Figure 4) depict each of the exhibit prototypes and the ways they appeared on the museum floor for Iterations 1 and 2.

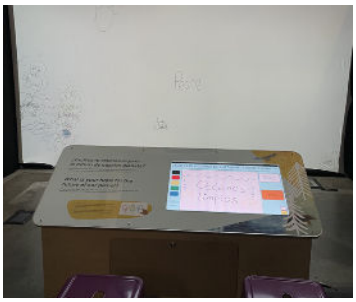
<table>
<tr><th colspan="2">Landscape of Emotions</th></tr>
<tr>
<td>Iteration 1
 
In this immersive multisensory experience, visitors enter how they feel about climate change on a touchscreen. The environment projected on the wall responds with changes in weather and mood corresponding to the emotion. Cumulative data shows a comparison of the visitor's feelings with how others have felt.</td>
<td>Iteration 2
 
Visitors enter on a touchscreen the degree to which they have a range of feelings related to climate change using sliders on a touchscreen. After visitors have submitted their responses, an animation activates and cumulative data shows how others responded to climate change. Duplicate stations of the same activity side-by-side allow groups of visitors to do the activity at the same time.On the wall are two posters, one with instructions and the other with images of youth engaging in climate action.</td>
</tr>
</table>

Imagining the Future

Iteration 1

Using the idea of a basic "talkback wall", visitors respond to a prompt to draw or describe their hope for the future on a sticky note that they post on a wall. In front of the wall is a table that provides sticky notes and colored pencils.

Iteration 2



Visitors share their hopes for the future by drawing or writing words that get projected onto a wall. Visitors use a touchscreen monitor to write or draw in different colors and send the image onto the projected wall. Visitors are invited to respond to the question, "What is your hope for our planet and our future?"

Climate Action Venn Diagram

Iteration 1

A couple of posters with images of two people and a colorful Venn diagram invites visitors to create their own climate Venn diagram by identifying what specific, community-level climate actions they could take. Visitors can answer by writing or drawing two initial prompts: 1."What am I good at?" and 2." What needs to happen in our communities?" These prompts are printed on letter sized paper and correspond with two circles that resemble a Venn diagram. In the overlap there is text that reads "3. My climate

Iteration 2

A couple of posters with images of two people and invites visitors to create their climate Venn diagram. The diagram is printed on the table surface with three overlapping circles. Each circle has a space to place blocks printed with possible answers to three corresponding reflection prompts. The overlapping space at the center of the diagram holds a final prompt to think about how the visitor's answers to the three first questions overlap to create a personally relevant and feasible climate action.

action". A question appears to the right of the diagram: "How can I help with climate solutions?" Below the question there is space in which visitors can write or draw their climate action. The paper is on a tray that contains colored pencils on a table that allows for 3 seats. An onscreen interactive on the table guides visitors through options that could help them answer prompt #2. Visitors have the option to take with them their Venn diagram or post it on a wall that includes examples from previous visitors.	Three identical activity stations next to each other at the same table allow visitors to interact and come up with solutions in groups.
Making Waves	
Iteration 1  This educational video game features a large digital screen displaying a serene pond scene with gentle water and nature sounds in the background.Guided by a friendly otter, visitors answer multi-choice questions about climate actions. They receive stones of different sizes according to the relative impact of their choices. Visitors then throw their stones into the pond using a trackball. The stones make a fun splash sound and animation, with the stones for community actions making the biggest splashes.	**Iteration 2**  This component was almost the same as Iteration 1. It only had minor changes to onscreen graphics and instructions for Iteration 2.

We Need to Talk	
Iteration 1  Visitors practice having climate conversations with a focus on establishing interpersonal connections of common values, interests, and experiences. By playing a 'Would You Rather' type conversation game visitors ask each other questions, listen to each other's answers, and consider what they may have in common. A spinner surrounded by seats allows visitors to choose conversation prompts while facing each other.	**Iteration 2**  This component was almost the same as Iteration 1. Half of the "Would you rather" questions were changed to open-ended reflection questions.

Figure 4. Descriptions of Iteration 1 and Iteration 2 exhibit prototypes

Methods

This study used data collected for the exhibit formative evaluation of Iteration 1 by the Colaborativo and of Iteration 1 and 2 by OMSI staff. The participant pool included both museum visitors and a convenience sample of recruited families (Spanish-speaking and bilingual with youth ages 12–18) and low-vision individuals. Data collection methods included observations and group interviews. Data collectors' levels of comfort speaking English varied. Colaborativo members preferred to conduct interviews in Spanish. Observations were conducted regardless of the language that a family or group spoke while at the exhibit. OMSI staff were fluent in both Spanish and English. One of the data collectors was also fluent in Russian. All of these methods were conducted during the formative period and took place in the hallway of OMSI's Empirical Theater across from the cafe. The number of observations and interviews is included in the following section.

Recruitment

Participant recruitment varied by the iteration. During Iteration 1, Colaborativo members recruited families and groups from the Latine community. To reach the desired sample size,

they recruited participants from the museum floor. For data collection during an OMSI Family Science Night (FSN) event, Adelante Mujeres staff recruited families and groups from the Latine community. In Iteration 1, data was also collected by a combination of Colaborativo members observing groups and OMSI staff conducting interviews when participants only spoke English.

Iteration 2 focused on the intentional recruitment of Latine and Spanish-speaking bilingual families and groups. This effort took place at the end of December 2024 and the beginning of January 2025. The main recruitment tool was a flyer targeting Spanish-speaking and bilingual (Spanish/English) families with youth aged 12–18. The flyer summarized the evaluation activities and provided dates and times of participation opportunities. The Voces team collaborated with community organizations that maintain strong connections within Spanish-speaking and bilingual communities to share the project flyer in hard copy and digital form to augment recruitment.

Consent

Upon arriving at the museum, recruited families were guided to the prototypes, and given general admission bracelets for each member of the group. Participants ages seven and older were asked to review and sign consent forms before receiving an orientation to the activity; those younger than seven were asked to provide verbal assent. Families were asked to engage with the prototype components for a minimum of 20 minutes. During this time, staff were available to answer questions about the evaluation activities, the use of participant data, and incentives. No photos were taken of recruited families.

For general visitors, two signs informed visitors that once they entered that area they would be observed.

Data collection

During data collection activities, when recruited families and groups were scheduled to visit the museum, the Voces prototypes were closed to the public. This allowed the recruited families to explore the exhibit components without distractions from general museum visitors. When data were collected from general visitors, the Voces area was open to the public.

Data collectors worked in pairs in a combination of Colaborativo and/or OMSI staff members for Iteration 1. For Iteration 2, Only OMSI staff collected data by working in pairs After each family completed their exploration, one of the staff members administered a questionnaire. Upon completion of the questionnaire, families were free to explore the museum.

Incentives and incentive tracking

Incentives were used only in Iteration 2. As a "thank you" for their participation, each recruited family received general admission to the museum for the date of their visit, along with general admission passes for a future visit. Additionally, each participating family/group was provided with a $40 VISA cash card.

To ensure accurate distribution and tracking of these incentives, unique codes on the passes and cash cards were recorded, verifying that each family received their designated cards and passes.

Data by iteration

The data used for this study were collected from both iterations of the formative evaluation. Table 1 below provides a summary of the data collected by iteration, method, and data collectors.

Table 1. Summary of data collected in each iteration by method

Iteration	Methods	Participants	Data collector
Iteration 1: Oct 26 to Nov 2, 2024; Nov 25 to Dec 14, 2024	Observations: 69 Interviews: 11	Recruited and general visitors	Colaborativo OMSI staff
Iteration 1: Family Science Night (FSN) Nov 12, 2024	Observations: 15 Interviews: 14	Recruited	Colaborativo OMSI staff
Iteration 2: Dec 22, 2024 to Jan 4, 2025	Observations: 25 Interviews: 25	Recruited	OMSI staff

Data analysis

Since the data used for this study were already entered and analyzed during the formative evaluation phase, the data analysis for the Framework consisted of reviewing the data sets (qualitative data from observations and interviews) by iteration. This process involved creating a Google Sheet that contained templates of the Framework—one tab for each of the Voces prototypes; each tab included both iterations. All the data sets were reviewed and annotations were tracked in a specified column for evidence from observations and participants' self-report that could be traced to exhibit characteristics related to

outcomes and theories used in the Framework. Since the data collected was primarily focused on the prototyping phase and improving the prototypes, OMSI evaluation staff found it valuable for analysis and drafting this study.

Results

A summary of the exhibit characteristics that emerged from the data are presented in Table 2. This summary represents an inventory of all the tables in Appendix D, which depict the results for each exhibit prototype per iteration. Some of the exhibit characteristics presented in this summary overlap with respect to some outcomes and categories. For example, multi-user and Spanish/bilingual labels are noted more than once in Table 2.

Table 2. Exhibit characteristics that appear to support intended visitor experience outcomes: summary of the results

	Engagement	Awareness of climate conversation	Practice climate conversation *	Intention toward climate actions
Hands-on/ multisensory	• Multi-user (multi-sided) • Seating/space for multiple people • Open-ended to multiple choice spectrum • Combine interactives: create, write, draw • Spanish/bilingual labels	• Labels and content in the form of questions and invitations about the importance/need for talking about climate change as a first step towards actions	• Multi-user Interactive activity that allows to sort, create • Artifacts left behind that include messages, drawing, visualizations in relation to future, hope, emotions	• Interactives and activities that offer limited options, choices and connect them to actions/solutions • Invitation in labels in the form of questions about what actions and choices can visitors do
Stories/ metaphors	• Use images, words, effects, sounds as metaphors • Labels inviting to imagine, visualize, share • Labels that invite open-ended, creative/imaginative answers • Artifacts that invite the public to be observed, read		• Open ended questions that invite to verbalize and share answers in relation to common values, interests	
Context	• Open-ended activities that invite imagination and/or include unexpected combination of topics with visuals and effects offering alternative narratives • Open-ended activities that provide options that are relatable		• Spanish/bilingual labels in the form of hypothetical questions that invite to verbalize and take turns	• Labels and content within a context of community level
Directness	• Invitations in labels include questions on the direct side of the spectrum for open-ended or multiple choice activities • Open-ended activities that invite creative answers such as drawing, writing, observing effects, visuals • Label instructions that are direct			• Open-ended activities that provide steps of potential actions

*Exhibit characteristics noted for the outcome of *Practice climate conversation* emerged as visitors' verbal communications and/or conversation seeds, but not full conversations.

Overall, exhibit characteristics connected with the category of directness, such as open-ended activities and the use of activities that invite questions or the imagination can support the *Engagement* outcome (second column from the left in Table 2). Regarding the outcome of *Awareness of climate change conversations* that could lead to climate actions, only *Hands-on/multisensory* characteristics related to content and labels show data that supports this outcome.

The outcome of *Practice climate conversation* was supported by the categories of *Hands-on/multisensory* and *Stories /metaphors* in relation to exhibit characteristics that are multi-user, artifacts that are left behind, and questions that invite visitors to verbalize shared values and interests. For the *Context* construct category, exhibit characteristics that emerged were related to language, such as labels in Spanish that invite visitors to verbalize answers to questions and take turns. The characteristics for this outcome were emergent and supported verbal communication exchanges among participants, though not necessarily climate change conversations per se.

Labels and interactives (open-ended activities) are exhibit characteristics noted for the outcome of *Intention toward climate actions* (last column from the left in Table 2). These characteristics seem key when exploring the constructs of *Context* and *Directness* with respect to characteristics such as labels in the form of invitations and open ended questions and activities that are relatable for the Latine participants.

Further testing could support and/or refine exhibit characteristics in favor of eliciting climate conversations and what they may be like for Latine Spanish-speaking/bilingual families and groups.

Voces Exhibit Development Preliminary Framework and commentary

Summary of the process we followed in this study

The goal of this exploratory study was to create an evidence-based Preliminary Framework of exhibit characteristics that support the proposal logic model outcomes (see Exhibit Outcomes section of this report pages 9–10 and Appendix A). Given the project ambitions, of particular interest was evidence of exhibit characteristics that support the practice of climate conversations in ways that resonate with Latine and Spanish-speaking/bilingual families and groups. For this, OMSI staff reviewed data sets from the exhibit development formative evaluation phase, including participants' self-report and data collectors' observation of participants with respect to the Voces exhibit prototypes. Additionally, this

report relied on theories compiled by Voces project team members, including constructs from the intercultural communication field.

By leveraging theories and concepts from research on conversations at exhibits and intercultural communication, and applying them (in the form of an inventory) to the Voces exhibit prototypes, a preliminary framework was created that can encourage exhibit and content developers to further explore and test exhibit characteristics that could support climate change conversation for Latine Spanish-speaking/bilingual families and groups.

The Exhibit Development Preliminary Framework is a synthesis of ambitions, theory, and evidence

This Exhibit Development Preliminary Framework is a synthesis of the Voces team's ambition (so far) to address a need in the field by leveraging theories related to climate conversations and exhibit design that are likely to be useful, and evidence from visitor interactions with the project's first five prototypes. To create this synthesis, OMSI evaluation staff made assumptions related to intercultural communication theories, exhibit characteristics, and climate change communication and activities (see the section on Voces Exhibit Development Preliminary Framework Study goals).

The Voces Exhibit Development Framework created by the OMSI evaluation staff (Figure 5) in the form of a Preliminary Framework provides a preliminary list of exhibit characteristics for museum practitioners to consider when examining and prioritizing attributes that resonate with and enable Latine and Spanish-speaking/bilingual groups to engage in climate conversations at unfacilitated exhibits. A next step could be to focus and prioritize the outcome of *Practice climate conversation*. Exhibit characteristics listed in that column (see fourth column from the left in Figure 5) emerged from participants' verbal exchanges which were only conversation seeds that need to be nourished by the exhibit in order to grow into what the project team wants to see as a fuller climate conversation. To do this, exhibit characteristics need to be revised and refined. The challenge and the richness in this case, may be diving deeper into one angle to complement the other in the context of affordances at exhibits:

- How do climate conversations look for Latine and Spanish-speaking bilingual groups in general (if possible) and what from this can be observed within an unfacilitated exhibit context.

The objective for the final Voces Exhibit Development Framework was to present unfacilitated exhibit strategies and characteristics that promote climate conversations

among Latine and Spanish-speaking bilingual visitors; the Preliminary Framework offered in this report provides a step towards the development of such a framework. The Exhibit Development Preliminary Framework weaves contributing theories, exhibit characteristics, and intended group outcomes to provide a tool that is usable and adaptable when refining and developing exhibits.

Contributing Theories	Outcomes			
	Engagement	**Awareness of climate conversation**	**Practice climate conversation ***	**Intention toward climate actions**
Hands-on/ multisensory	**Activities** • Multi-user (multi-sided) • Seating/space for multiple people • Combinations of interactives: create, write, draw **Labels** • Open-ended to multiple choice spectrum • Spanish/bilingual labels	**Labels** • Labels and content in the form of questions and invitations about the importance/need of talking about climate change as a first step towards actions	**Activities** • Multi-user Interactive activity that allows to sort, create • Artifacts left behind that include messages, drawing, visualizations in relation to future, hope, emotions	**Activities** • Activities that offer limited options/choices and connect them to actions/ solutions **Labels** • Invitations in the form of questions about actions and choices visitors can do
Stories/ metaphors	**Activities** • Artifacts that invite the public to be observed, read **Labels** • Images, words, effects, sounds as metaphors • Labels that invite: imagine, visualize, share • Labels that invite: open-ended, creative, imaginative answers		**Labels** • Open ended questions that invite to verbalize and share answers in relation to common values, interests	

Context	**Activities**
	• Open-ended activities that:
	  ○ Invite imagination, include unexpected combination of topics with visuals and effects offering alternative narratives
	  ○ Provide options that are relatable
	  ○ Invite creative answers such as drawing, writing, observing effects, visuals
			Labels
			• Spanish/bilingual labels in the form of hypothetical questions that invite to verbalize and take turns
				Labels
				• Labels and content within a context of community level

Directness	**Labels** • Invitation in labels that includes questions on the direct side of the spectrum for open-ended or multiple choice activities • Label instructions that are direct			**Activities** • Open-ended activities that provide potential action steps

Figure 5. Voces Exhibit Development Preliminary Framework

*Exhibit characteristics noted for the outcome of *Practice climate conversations* emerged from visitors' verbal communications and/or conversation seeds, but not full conversations

Critical commentary on process and product

The Exhibit Development Preliminary Framework was conceived from an adaptation of the proposal logic model outcomes (see Appendix A) and data from the exhibit formative evaluation phase. The intended outcomes were constrained to those listed in the project proposal and were not reviewed or updated by Colaborativo and Adelante Mujeres staff. Similarly, much of what emerged from the data analysis focused on exhibit strategies in relation to each individual exhibit prototype. As a result, the evidence available from the prototype testing was scant and at that time did not focus on the Exhibit Development Framework content, meaning there was no theory of action nor were there constructs in support of one. Thus, the process for creating this Preliminary Framework relied heavily on exhibit strategies and identifying contributing theories that were relevant to exhibit characteristics in the form of activities and labels. The way these characteristics emerged varied by iteration during the exhibit formative evaluation. This may have been in part because some data collection interactions included more than one group at an exhibit, while others (particularly Iteration 2) only included one group at a time. Regardless, more evidence is needed on the ways in which multiple groups, particularly Latine and Spanish-speaking bilingual groups, simultaneously engage in climate conversations. Additionally, project partners or Colaborativo members were not involved in the creation of the Voces Preliminary Framework, resulting in a framework and contributing theories that lack the deeper insights of the Latine community.

In terms of theories, the Exhibit Development Preliminary Framework currently spotlights just three theoretical perspectives. Two theories are interested in verbal communication and conversations at exhibits (Callanan et al., 2017) and metaphors and storytelling in exhibits (Mortensen, 2011; Popoli & Derda, 2021). The third focuses on intercultural communication (Storti et al., 1997; Office of Minority Health, n.d.). While these theories are a starting point in exploring Latine audiences and how climate change conversations could look for them, it is still unclear how these theories can influence or explain which exhibit characteristics resonate with Latine and Spanish-speaking bilingual families and groups, and for them to have climate conversations.

Potential for future studies and evolution of the Exhibit Development Framework

Potential studies could benefit from research approaches that examine the interplay between constructs related to intercultural communication, ways of knowing from the Latine culture, and exhibit experiences.

Constructs from intercultural communication can be used to build on the thinking provided by Katharine Hayhoe (Hayhoe, K. 2024) regarding climate change conversations. Hayhoe's

three steps: finding a common interest or something that someone (with whom one is to have a climate conversation) values, connect that value to climate change, and talk about solutions, are useful for English-speaking audiences, however they may not resonate with Latine and Spanish-speaking bilingual groups and families. Evidence in this study suggests that although climate conversations, as in the Hayhoe steps, were not fostered by the exhibit prototypes, the verbal exchanges that occurred among participants with respect to the topic of climate change are seeds that might be germinated through the proposed intercultural constructs (e.g. *Context* and *Directness*). Furthermore, these constructs could also influence how Katharine Hayhoe's steps (2024) may look when adapted to Latine and Spanish-speaking/bilingual groups.

Although not considered in depth and only through the lens of intercultural communication, practitioners (exhibit and content developers) would benefit from exploring the role of Latine and Spanish-speaking "funds of knowledge" and the extent of unfacilitated exhibit characteristics supporting the approaches that Latine have when doing and talking about a complex topic such as climate change. Furthermore, considering Latine ways of knowing from the perspective that worldview shapes language, along with the affordance lens (Gibson, 1979; Norman, 1988), could be a useful opportunity to see ways in which Latine ways of having conversations are influenced by various environments (other than exhibits) that could be adapted in the form of exhibit activities.

Finally, exhibit characteristics in relation to the construct "task or the person" nested in the *Hands-on/multisensory* category of contributing theories of the Framework (Figure 2), did not emerge in the results. This theory as suggested by Sorti et al. (1997) states that in cultures other than the American one, the communications are usually relational in nature, meaning the relationship with a person (or people) is as important as the task (or activity) at hand. As exhibit and content developers test the Preliminary Framework, they could explore what exhibit characteristics could balance activity objectives (hands-on and/or interactives), content, and labels with the person, and the ways in which this resonates with Latine audiences. This could also enrich future frameworks that are for Latine and Spanish-speaking bilingual families and groups who engage with exhibits and climate change topics.

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Appendix A: Exhibit logic model

Voces Working Draft Exhibit Logic Model

Project Strategies	Exhibit Objectives	Intended Outcomes for Visitors	Exhibit Design Strategies	Example Data Collection Methods	Measures of Success
Strategies for broadening participation (evidenced by inclusion and accessibility) in climate change conversations in exhibit experiences: Project practices that foster sense of belonging. • Building on asset-based approaches with focal community leadership, partnership, and voice throughout the project (Migus, 2019) • Prioritizing culturally-responsive approaches, including working in Spanish and/or English and incorporating popular education approaches for peer learning Project practices that promote equity in co-constructing decisions and experiences. • Positioning climate change conversations, not as an end, but as a means for focal communities to realize their values and goals (Bevan et al., 2018) • Structuring the project centering the *Colaborativo* to co-construct questions, processes, reviews, interpretations, and summaries of project activities and results though a community-based participatory engagement approach	*Voces* will contribute to broadening participation in climate conversations and action in OMSI's ISL experiences for Latine(x/o) audiences, specifically youth grades 6–12 and their families. **Educational Approach**	Visitors: • Name at least one way they perceive that climate change is personally relevant to them • Are aware that community level climate action is necessary to reduce and adapt to the impacts of climate change • Are aware that family and community members, including themselves, need to talk about climate change in order to foster community level climate actions • Practice observable climate action communication skills • Self report skills for future climate action conversations with family and friends	• Exhibit content and activities that promote solutions-based conversations about climate change • Aligning with regional climate action and climate justice plans (OEC, 2022; OEJTF, 2016) • Adapting tested activities from *A Climate of Hope* (Thompson, 2022) • Designing opportunities to practice conversations that support awareness of community action impacts	INVITED SUMMATIVE PARTICIPANTS: Youth from Latine(x/o) communities and their families will be invited to participate in summative evaluation activities. Participants will engage with the exhibit experience, including trying conversations. VIDEO OBSERVATIONS Project team members will video-record some participants at the exhibit. To do this, we prefer working with the families to identify a focal visitor in the target group to wear a microphone. Unit of video observation: Individual Sample size: 25 NATURALISTIC OBSERVATIONS Project team members will observe some participants while they engage with the exhibit; team members will use an observation guide to note the climate action communication skills that occur in the group. Unit of naturalistic observation: Family Sample size: 100 INTERVIEWS Project team members will ask some participants for an interview after their exhibit experience. The data gathered will include open-ended and categorical. Unit of interviews: Individual Sample size: 100	Criteria of success, <u>not comparisons</u>, will be used to assess the extent to which the evidence supports claims. This means that differences among groups will not be taken into account as measures of success 60% of youth and 65% of adults: 1. Name at least one way they perceive that climate change is personally relevant to them 2. Are aware that community level climate action is necessary to reduce and adapt to the impacts of climate change 3. Are aware that family and community members, including themselves, need to talk about climate change in order to foster community level climate actions 4. Self report skills for future climate action conversations with family and friends 5. Practice observable climate action communication skills

Guiding research question: What exhibit approaches and content effectively support Latine(x/o) and Spanish-speaking visitors' (youth in grades 6–12 and their families) awareness of the need for public discourse and skills for climate change conversations in their communities and everyday lives? Deliverables: 800 sq. ft. bilingual exhibit(s) and Framework

Appendix B: Instruments - Iteration 1

Group #_____ Observation Form

During data collection, take open notes about the group behaviors.

Observer name:	**Date:**
Notes about the group:	**Group Language:** Spanish English Other

Group description: Age (Mark F o M) 0-5____ 6-10____ 11-14____ 15-18____ 19-29____ 30-49 ____ 50+____

We Need to Talk (Would You Rather?)
Time_____

1. Did a group member read at least one of the questions on the wheel out loud?
   ☐ Yes ☐ Unsure ☐No
2. Did anyone turn or spin the wheel?
   ☐ Adult ☐ Youth ☐ Child ☐ None
3. Did members of the group have any conversation about the environment, climate, or anything related to climate change?
   ☐ Yes ☐ Unsure ☐No

Note:
_____

Climate Action (Venn Diagram)
Time_____

1. Did a member of the group complete the activity?
   ☐ Yes ☐ Unsure ☐No
2. Did any group members use the prompt generator as a tool to reflect on the activity?
   ☐ Yes ☐ Unsure ☐No
3. Did the group spend any time reading other peoples' worksheets on the display?
   ☐ Yes ☐ Unsure ☐No

Note:
_____

Imagining the Future Time_____

1. Did the group spend any time reading the existing posts on the wall?
   ☐ Yes ☐ Unsure ☐No
2. Did at least one person in the group write/draw on a post-it and place it on the wall?
   ☐ Yes ☐ Unsure ☐No
3. (If yes to above) Did their message show a response to the prompt?
   ☐ Yes ☐ Unsure ☐No

Note:
_____

Landscape of Emotion Time_____

1. Did at least one group member complete the whole activity?
   ☐ Yes ☐ Unsure ☐No
2. Did they read and indicate their emotions on the touchscreen?
   ☐ Yes ☐ Unsure ☐No
3. Did they observe or say something about the screen with the graph showing other peoples' emotions?
   ☐ Yes ☐ Unsure ☐No
4. Did the group have any conversation about their feelings about climate change?
   ☐ Yes ☐ Unsure ☐No

Note:
_____

	**Making Waves Time_____** 1. Did at least one group member play the game from the beginning to the end? ☐ Yes ☐ Unsure ☐No 2. Did they read through and evaluate the questions in the game? ☐ Yes ☐ Unsure ☐No Note: _____	**Note:** Which parts of the components support the climate change conversations, questions, or concerns that the group asks. Which parts of the components are confusing.

Overall exhibit – with respect to Climate change

Did a group member…..	Yes	Unsure	No	If yes, what did you hear or observe?
1. Talk about **climate change**?				
2. Talk about their **emotions / feelings** related to climate change? Fear, uncertainty, worry, hope				
3. Express any **connection t**o their life?				
4. Express **ideas** of actions / behaviors?				
5. Ask others about their **thoughts and perspectives** on climate change?				
6. Listen attentively and **resist the urge to interrupt**?				
7. Talk with them about or find a **personal connection** to climate change?				
8. Probe gently to discover others **feelings, values, or concerns**?				
9. Share a **personal story** about climate change?				
10. Share **something learned** from the conversation?				

Grupo #_____

Formulario de entrevista: Iteration 1

“Hola, mi nombre es _____ y él/ella es _____. Trabajamos aquí en OMSI, y estamos hablando con distintas personas sobre sus experiencias con estas actividades. Su opinión es importante¿Tiene tiempo para una conversación con nosotros? Pueden dividirse en pares (si el grupo es menos de cuatro pueden hacerlo en grupo) y después compartir sus ideas con nosotros?

- Si un amigo o amiga te pregunta qué conexiones hiciste de estas actividades con tu vida personal ¿qué compartirías?

- ¿Qué actividad(es), te ayudarían a hablar sobre el cambio climático con tus amigos? ¿Podrías compartir cómo sería esa conversación?

- ¿Hay alguna actividad que te inspiró a hacer algo en tu comunidad, familia o amigos?

- ¿Qué nos recomienda hacer para mejorar esta exhibición?

*(Si el grupo estuvo jugando con *Landscape of emotions* haga esta pregunta)

- Cuando vio la gráfica de las emociones, ¿qué le pareció, qué sintió, hay algo que no entendió?

*(Si el grupo estuvo jugando con *Making Waves* haga esta pregunta)

- ¿De qué crees que se trata esta actividad? Te parece una actividad fácil o difícil ¿Porqué?

*(Si el grupo estuvo jugando con *We need to talk* haga esta pregunta)

- ¿Hay algo en particular del juego que no se entendió? ¿Cómo se podría mejorar esta actividad?

Interview Form – Iteration 1

Select one option of this activity: Interview form brainstorm form

Observer name:	Date:
Group No:	

“Hello, my name is _____ and he/she is _____. We work here at OMSI, and we are talking to different people about their experiences with these activities. Your opinion is important. Do you have time to talk with us? Can you discuss one question in pairs (or as a group if less than 4 people)and then share it with us?

- If a friend asked you what connections you made from these activities to your personal life, what would you share?

- What activity(ies) would help you talk about climate change with your friends? Could you share what that conversation would be like?

- Is there an activity that inspired you to do something in your community, family or friends?

- What do you recommend to us to improve this exhibition?

*(If the group was playing with Landscape of emotions ask this question)

- When you saw the graph of emotions, what did you think, what did you feel, is there anything you didn't understand?

*(If the group was playing Making Waves ask this question)

- What do you think this activity is about? Does it seem like an easy or difficult activity to you? Why?

*(If the group was playing with We need to talk ask this question)

- Is there something in particular about the game that I didn't understand? How could this activity be improved?

Appendix C: Instruments - Iteration 2

Observation Form Group #_____Observation Form - Iteration 2: Dec 2024– Jan 2025

Observer names:	**Date:**
Notes about the group:	**Group Language:** Spanish English Other **Group:** Recruited GA Other:_____

Group description: Age (Mark F o M) 0-5____ 6-10____ 11-14____ 15-18____ 19-29____ 30-49 ____ 50+___

We Need to Talk (WT) Time_____

1. Did a group member read at least one of the questions on the wheel out loud?
   ☐ Yes ☐ Unsure ☐No
2. In general did the group have any conversation?
   ☐ Yes ☐ Unsure ☐No
3. Did members of the group have any conversation about the environment, climate, or anything related to climate change?
   ☐ Yes ☐ Unsure ☐No

Note:
_____

Climate Action (Venn Diagram) Time_____

1. Did a member of the group complete the activity?
   ☐ Yes ☐ Unsure ☐No
2. Did members of the group have any conversation about the environment, climate, or anything related to climate change?
   ☐ Yes ☐ Unsure ☐No
3. Did more than one person do the activity in the group at the duplicate station?
   ☐ Yes ☐ Unsure ☐No

Note: _____

Imagining the Future (IF) Time_____

1. Did the group spend any time reading the existing posts on the screen?
   ☐ Yes ☐ Unsure ☐No
2. Did at least one person in the group write/draw on the touchscreen and send it to the wall projection?
   ☐ Yes ☐ Unsure ☐No
3. (If yes to above) Did their message show a response to the prompt?
   ☐ Yes ☐ Unsure ☐No

Note:
_____

Landscape of Emotion (LE) Time_____

1. Did at least one group member go to the graph / charts on the screen?
   ☐ Yes ☐ Unsure ☐No
2. Did they read and indicate their emotions on the touchscreen?
   ☐ Yes ☐ Unsure ☐No
3. Did they observe or say something about the screen with the graph showing how Americans feel about climate change?
   ☐ Yes ☐ Unsure ☐No
4. Did the group have any conversation about their feelings about climate change?
   ☐ Yes ☐ Unsure ☐No

Note:
_____

Making Waves (MW) Time_____

1. Did at least one group member play the game from the beginning to the end?
   ☐ Yes ☐ Unsure ☐No
2. Did they read through and evaluate the questions in the game?
   ☐ Yes ☐ Unsure ☐No

Note:
_____

Note:
Which parts of the components support the climate change conversations, questions, or concerns that the group asks.

Which parts of the components are confusing.

Group #_____ Data collectors:

Observation Form – Iteration 2– Dec 2024– Jan 2025

Overall exhibit – with respect to Climate change

Check the exhibit(s)	Check the person at exhibit	What was said (or done)	What did you hear or observe? Note also if dialog and/or one-way conversation
☐ WT ☐ Venn ☐ IF ☐ LE ☐ MV	☐ Adult ☐ Youth ☐ Child ☐ None	1. Talk about their **emotions / feelings** related to climate change? Note: Fear, uncertainty, worry, hope	
☐ WT ☐ Venn ☐ IF ☐ LE ☐ MV	☐ Adult ☐ Youth ☐ Child ☐ None	2. Express **ideas** of **actions / behaviors** to address climate change?	
☐ WT ☐ Venn ☐ IF ☐ LE ☐ MV	☐ Adult ☐ Youth ☐ Child ☐ None	3. Ask others about their **thoughts and perspectives** on climate change?	
☐ WT ☐ Venn ☐ IF ☐ LE ☐ MV	☐ Adult ☐ Youth ☐ Child ☐ None	4. Talk about or find a **personal connection** to climate change?	
☐ WT ☐ Venn ☐ IF ☐ LE ☐ MV	☐ Adult ☐ Youth ☐ Child ☐ None	5. Share their **values, or concerns about climate change**?	
☐ WT ☐ Venn ☐ IF ☐ LE ☐ MV	☐ Adult ☐ Youth ☐ Child ☐ None	6. Share a **personal story** about climate change?	
☐ WT ☐ Venn ☐ IF ☐ LE ☐ MV	☐ Adult ☐ Youth ☐ Child ☐ None	7. Share **something learned** from the conversation and/or the exhibit?	
☐ WT ☐ Venn ☐ IF ☐ LE ☐ MV	☐ Adult ☐ Youth ☐ Child ☐ None	8.Are there topics or ways in which visitors talk about **climate change**?	

Entrevista Iteration 2: Dic 24-Ene 25

Select one option of this activity: Interview form brainstorm form

Observer name:	**Date:**
Notes about the group:	**Group Language:** Spanish English Other **Group:** Recruited GA

"Hola, mi nombre es _____ y él/ella es _____. Trabajamos aquí en OMSI, y estamos hablando con distintas personas sobre sus experiencias con estas actividades. ¡Tu opinión es importante!

- Si un amigo o amiga te pregunta qué conexiones hiciste o qué pensaste de estas actividades con respecto a tu vida ¿qué compartirías?

- ¿Qué actividad(es), te ayudarían a hablar sobre el cambio climático con tus amigos? ¿Podrías compartir cómo sería esa conversación?

- ¿Hay alguna actividad que te inspiró a hacer algo en tu comunidad, familia o amigos?

- ¿Qué nos recomienda hacer para mejorar esta exhibición?

*(Si el grupo estuvo jugando con ***Landscape of Emotions*** haga esta preguntas)

- ¿Cómo te sentiste al compartir tus emociones sobre el cambio climático usando los controles deslizantes?
- Cuando viste el gráfico sobre cómo se sienten los estadounidenses respecto del cambio climático, ¿qué pensaste o sentiste?
    - ¿Qué otra información sería interesante incluir sobre actitudes y opiniones? (prompt: ¿qué otro contenido sería interesante incluir?)

*(Si el grupo estuvo jugando con ***We Need to Talk*** haga esta pregunta)

- ¿Hay algo en particular del juego que no se entendió? ¿Cómo se podría mejorar esta actividad?
- ¿Qué pregunta o preguntas te gustaron más? (prompt. Que preguntas incluirías?)

Muchas gracias!

Interview Iteration 2: Dec 24–Jan 25

Select one option of this activity: Interview form brainstorm form

Observer name:	**Date:**
Notes about the group:	**Group Language:** Spanish English Other **Group:** Recruited GA

"Hello, my name is _____ and he/she is _____. We work here at OMSI, and we are talking to different people about their experiences with these activities. Your opinion is important. Do you have time to talk with us? Can you discuss one question in pairs (or as a group if less than 4 people) and then share it with us?

- If a friend asked you what you learned or if anything you did here made you think about your life, what would you share?

- What activity(ies) would help you talk about climate change with people in your everyday life, such as friends and/or family? Could you share what that conversation would be like?

- Is there an activity that inspired you to do something or think about doing something with a group or community you belong to, friends or family?

- What do you recommend to us to improve this exhibition?

*(If the group was playing with **Landscape of Emotions** ask this question)

- How did it feel to share your emotions about climate change using the sliders?
- When you saw the graph of how Americans feel about climate change, what did you think/feel?
  - What other information would be interesting to include about attitudes and opinions? (prompt: what other content would be interesting to include?)

*(If the group was playing with **We Need to Talk** ask this question)

- Is there something in particular about the game that you didn't understand? How could this activity be improved?
- Which question or questions did you like best?

Thank you so much!

Appendix D: Results by outcome and exhibit prototype

Results in this section are organized by outcome with respect to the exhibit prototypes. Using the Preliminary Framework,this section presents exhibit characteristics from Iteration 1 and 2 of the five exhibit prototypes. The reason that both Iteration 1 and 2 were analyzed is that some of the prototypes had substantial changes (see the section above, *Descriptions of exhibit prototypes*). Exhibit characteristics were noted as having some relationship with at least one of four outcomes and four theory categories. The four outcomes are Engagement, Awareness of climate action, Practice climate conversation, and Intention toward climate action. The four theory categories are Hands-on/multisensory, Stories/metaphors, Context, and Directness. Results in Tables D1 - D10 are organized by this order of prototypes:

- We Need to Talk
- Climate Action Venn Diagram
- Imagine the Future
- Landscape of Emotions
- Making Waves

Engagement

Observed exhibit characteristics that support the outcome of *Engagement* (see second column from left in Tables D1 - 10) are present in all the prototypes and iterations in various degrees with respect to the contributing theory categories (see row labels in the the left column of Tables D1–10). In the majority of prototypes, this outcome did not vary much with respect to Iteration 1 and 2.

For the Imagine the Future prototype, the *Engagement* outcome was more prevalent in Iteration 1 (see Table D5). Exhibit characteristics that supported *Engagement* with respect to the theory category of *Context* are linked to the labels in the form of questions and invitations that were open-ended and allowed for more implicitness in the participants' responses. Also, the wall provided in Iteration 1 allowed for several artifacts (in the hundreds) left for participants to read, not to get constrained in the type of answers they generated. Some participants were observed sitting in the area, writing and drawing. In some instances, caregivers in groups that included children were observed guiding and supporting the children in the creation of their notes for the future.

For the Landscape of Emotions prototype, the *Engagement* outcome was rich in Iteration 1 with respect to the theory category of *Stories/metaphors* (see Table D7). In Iteration 1, this prototype was set up as an interactive screen that projected visual effects on a landscape

on a wall, which enabled participants to connect and verbalize various emotions and feelings related to climate change as they did the activity and observe how the projected image changed. Evidence from observations noted that participants were surprised, interested, pleased, and excited when observing the effects on the projected wall.

Awareness of climate conversation

Participants' *Awareness of climate conversations* (including their importance in leading to actions) only emerged at the We Need to Talk prototype in Iteration 1 for the *Hands-on/multisensory* category (see Table D1). Labels and prompts were the characteristics that promoted awareness for some participants, since these characteristics asked participants to engage in talking and having conversations. At the Family Science Night (FSN) event, one participant self-reported that the prompts at this prototype, besides being easy, promoted verbal communication.

> *"Son fáciles las preguntas y porque estás hablando en ese momento".*
> (The questions are easy because you are talking at that moment.)

Practice climate conversation

The visitor outcome of *Practice climate conversation* seemed to be fostered by some exhibit characteristics. While this outcome is of particular interest for the Voces team, the results here show that when this outcome emerged, it emerged in the form of verbal communication that could be perceived as "conversation seeds". Verbal exchanges, communication, and reading of labels were done as ways to follow steps and/or understand the activities when participants were at certain prototypes, but these verbal communications did not blossom into the team's expectations for *Practice climate conversation* (i.e., following the steps highlighted by Hayhoe).

The data suggest that in four prototypes in both Iteration 1 and 2, this outcome was supported by exhibit characteristics in the theory category, Hands-on/multisensory. Specifically, the Climate Action Venn Diagram, Imagine the Future, Landscape of Emotions, and Making Waves prototypes promoted verbal communication that met the team's expectations for *Practice climate conversation.* Verbal communication in some instances consisted of adults asking questions of youth and children about their choices and decisions when doing the activities. For example, in one observed group at the Making Waves prototype, the youth responded to choices on the screen and the adult asked the youth why they thought each choice or response made sense. Similarly, one participant at the FSN, when asked about activities that would help them to talk about climate change, mentioned the Imagine the Future prototype because it allowed them to learn what their friends think about climate change.

For the We Need to Talk prototype, exhibit characteristics in the theory categories of *Stories/metaphors* and *Context* seemed to support *Practice climate conversation.* For instance, the prototype labels seemed to promote participants' verbalization in relation to the climate change topic. The label questions at this prototype suggested options that allowed participants to share their answers in ways that invited them to imagine solutions connected to specific topics that interested them. For example, one group at this prototype during the FSN event was observed talking about the options of how the ocean is affected by climate change including how evaporation affects the ocean. Additional label characteristics in the theory category of *Contextual* were identified when a group in Iteration 2 was observed having a discussion in Spanish about pollution and living in the past and the future. A participant in that group, when asked about activities that would help them to talk about climate change with others, mentioned the language choice:

> "La rueda de las preguntas. Me gustó que el español sea el primero."
> (the spinning wheel [in the We need to talk prototype], I liked that Spanish was first)

Intention toward climate actions

The outcome, *Intention toward climate actions*, emerged in all five prototypes at different points during Iteration 1 and/or 2 for the theory categories of *Hands-on/multisensory*, *Context*, and/or *Directness*.

Exhibit characteristics within the labels and type of activities supported this outcome and were connected with the theory category, *Hands-on/multisensory*. In the Climate Action Venn Diagram prototype, whether the activity was about creating a diagram by writing or drawing the content in Iteration 1 or choosing tiles to create one's own Venn diagram in Iteration 2, participants observed, weighed their alternatives and verbalized their choices. In an interview, one participant mentioned that this activity gave them ideas about community actions. Similarly at the Making Waves prototype, Iteration 1 and 2, the activity prompts asked participants to choose their answers to different questions; this allowed them to consider the different impacts resulting from various actions, therefore inspiring them to see their options at community, family, and individual levels.

Exhibits characteristics that promote *Intention towards climate actions* emerged only at the Climate Action Venn Diagram prototype in Iteration 2; in this case, the characteristics were connected with the theory categories of *Context* and *Directness*. The labels and activity at this prototype provided examples in context of climate activities and invited participants to consider different types of actions in a way that could be as directed or undirected as participants wished. One group observed sorting and verbalizing what tiles

could be grouped together and what actions are needed in communities; they were heard mentioning recycling, creating awareness for less trash, and taking care of the ocean. When asked about what activities inspired actions with their community, another participant's response provided examples such as gardening and recycling.

> *"El diagrama de Venn - [me inspiró a] como criar hortalizas y reciclar."*
> (The Venn diagram [inspired me to learn] how to grow vegetables and recycle.)

Iteration 1 and 2 data insights

Results from this data review of Iteration 1 and 2 for all five Voces prototypes suggest that the prototypes' exhibit characteristics most often supported the outcome *Engagement*. Some prototype characteristics, although less often, supported the outcomes *Awareness of climate action, Practice climate conversation,* and *Intention toward climate action*. These results are summarized in the Results section of this report and discussed in the Commentary section of the report.

Table D1. We need to talk prototype - Iteration 1

	Engagement	Awareness of climate conversation	Practice climate conversation	Intention toward climate actions
Hands-on/ multisensory	Can be used from multiple sides, seating for 3–4 + people, labels ask open ended questions,	Questions can promote awareness of the importance/need to talk about climate change		
Stories/ metaphors	"Would you rather game" type questions in a wheel that spins, can evoke fun game memories.		Conversation starter offered by the questions asked in labels and choice selected. Questions can promote opportunities to talk (conversation starter) about climate change, ask questions, take turns, verbalize values as what is common in participants communities	
Context	Questions in labels allow for visitors to create context. Responses allow for a spectrum of context self created.			
Directness				

Table D2. We need to talk prototype - Iteration 2

	Engagement	Awareness of climate conversation	Practice climate conversation	Intention toward climate actions
Hands-on/ multisensory	Spanish in labels as engaging. Can be used from multiple sides, seating for 3–4 + people, labels ask open ended and two option type questions			Ideas and answers that emerge from the activity questions, could promote post reflection in relation to intended actions (for example there is a question about volunteering)
Stories/ metaphors	Label: two types of questions allow for visitors to create stories, use imagination of solutions in their responses (for example, questions about super power). Responses allow for a spectrum of context self created.[example investing on potable water]			
Context	Offers within the context of the questions (in relation to climate change) opportunities for verbalizing answers that can be on the spectrum of context		Spanish in the labels as a way to promote conversation starters/ways to initiate verbal communication. conversation starter - offered by the hypothetical questions asked. Questions can promote opportunities to talk (conversation starter) by asking question and answering (taking turns), by proposing solutions	
Directness				

Table D3. Venn prototype - Iteration 1

	Engagement	Awareness of climate conversation	Practice climate conversation	Intention toward climate actions
Hands-on/ multisensory	Offers 3 sides with seating for 3+. Options in the activity allow for writing and verbalization of choices per each of the options. Labels in the digital generator invite participants to read them and use any as choices.			The activity process (creating the venn diagram) is supportive of ideating how to help.
Stories/ metaphors	Artifacts and products left in the form of worksheets included writing and drawings that can be read by visitors			
Context				
Directness	Instructions and choices for the options on the copy at the table and paper are direct yet not always clearer to understand.			

Table D4. Venn prototype - Iteration 2

	Engagement	Awareness of climate conversation	Practice climate conversation	Intention toward climate actions
Hands-on/ multisensory	Offers 3 sides with seating for 3+.Options in the activity allow for choosing/ sorting/weighing blocks (tiles) options and verbalization of choices. Activity allows for taking turns in choosing tiles, completing activity. Open ended activity- restricted by the shape of the tile.		The tiles' content and the sorting nature of the activity promotes verbal communication about (what visitor value) choices, opportunities to inquire - as conversation starters	The activity process and results, creating a venn diagram. Solutions that a visitor arrives at in the activity can offer opportunities for ideas of actions/intended actions (personal/family level) (for example volunteering, recycling). Sorting tiles promotes verbalization in the form of discussions of community actions (recycle, awareness, less trash) that could lead to intended actions.
Stories/ metaphors	Allows for creative verbalization in regards to blocks (tiles) choice.			
Context	Activity choices, selection of tiles could allow for non-verbal cues (nodding among) participants who are/prefer high in context nature.			Content and labels bring back context at the community level and direct to collective actions.
Directness	Activity instructions are direct and the solution can be open-ended (a not so direct and straightforward answer). Options in the tiles promote direct opportunities to consider pros/cons of choices and priorities.			Activity allows to see steps of potential actions (for example grow a garden and recycle)

Table D5. Imagine the future prototype - Iteration 1

	Engagement	Awareness of climate conversation	Practice climate conversation	Intention toward climate actions
Hands-on/ multisensory	Includes the use of drawing/writing on sticky notes. Supports engagement in groups as adults could help/support children to write and/or draw.		Activity from writing to posting notes on the wall, can be a precursor of a conversation starter by supporting visitor awareness of what each other value/connect to.	Artifacts (sticky notes left on the wall) could support ideas of intended actions with regards to what could happen in the future.
Stories/metaphors	Prior visitors work (the sticky notes) visible from afar; Artifacts and products left in the form of sticky notes on the wall included writing and drawings about various ideas and topics.			
Context	Label prompt in the form of an open ended question as well as previous artifacts left, can be taken as open as participants would imagine or to be taken literally as anything in the future (for example an answer was to get married) Artifacts can work as verbal communication exchange opportunities			
Directness	Label: open-ended question, and artifacts left can invite visitors to draw and write in an more open expressive way- because question could be read as open ended as visitor had hoped.			

Table D6. Imagine the future prototype - Iteration 2

	Engagement	Awareness of climate conversation	Practice climate conversation	Intention toward climate actions
Hands-on/ multisensory	The touch screen allows for drawing and/or writing, one person at the time. One person can use the touch screen, others can watch/read what others wrote that is on the screen.		Messages left and written on the wall can support common /value messages - in what it is the hope participants seek for the future.	Artifacts and doing the activity per se could support verbalization of ideas for intended actions (example minimize pollution, less cars, public transportation).
Stories/ metaphors	Pre-seeded and/or prior visitors work (on the screen) visible from distance; Artifacts and products left in the screen included writing and drawings that used colors and images as metaphors.			
Context				
Directness	Open-ended yet aimed toward climate change, allow for various responses that can range from direct, explicit, to indirect and imaginary.			

Table D7. Emotions prototype - Iteration 1

	Engagement	Awareness of climate conversation	Practice climate conversation	Intention toward climate actions
Hands-on/ multisensory	Images used for emotions (can include emojis and images on the projection)- allowed for relevance in self report about expressing concerns and emotions.		Content and topic of emotions can support verbal communication as conversation starters in the form of inquiring for others feelings/emotions.	Screen displaying viz of chart where visitors are with their emotions compared to the average can foster a sense of motivation towards intended actions.
Stories/ metaphors	Using effects for the emotions can foster a sense of surprise, awe, interest in emotions. Activity can foster feelings and ideas (for example, someone had feelings of happiness with the waterfall).			
Context	Open ended activity in which emotions that are assigned a visual effect provides higher context until a chart viz comparing results appears.			
Directness	Balance of not very directness as effects and image used for emotions is implied (indirect) and direct by showing results and comparisons of emotions in charts in the screen are observable (direct)			

Table D8. Emotions prototype - Iteration 2

	Engagement	Awareness of climate conversation	Practice climate conversation	Intention toward climate actions
Hands-on/ multisensory	Two stations with tablets next to each other that allow for individual and group interactions with the activity while answering questions, using the screen. It also allows visitors to read out loud their choices/responses.		Content and topic allow for verbal communication as conversation starter in the ways in which information can be shared (for example channels or mediums that could be relevant to share about emotions)	
Stories/ metaphors				
Context	On the low context spectrum, linked to emojis on the screen and emotions, based on choices allow visitors to see where they are with their emotions and compare them with a national chart.			
Directness	Information about the chart that represents America responses is direct, it shows as a concrete image on the screen (data Viz). Results from visitors can foster emotions of surprise, curiosity.			

Table D9. Making waves prototype - Iteration 1

	Engagement	Awareness of climate conversation	Practice climate conversation	Intention toward climate actions
Hands-on/ multisensory	Interactive screen, look and feel of a game (labels include options per each question) Options provided in the screen can allow visitors for verbalization of pros and cons or weight each option before making their decision.		Screen offers options of actions that can promote verbal communication as conversations starters of ideas for what choices could have a bigger impact and solutions.	Screen provides options of actions that can be done at individual, family, and community level; Options offered at various levels can inspire actions.
Stories/ metaphors	After selecting an option, the screen provides the results in the form of an observable visual - a rock that makes a splash on a lake- as a metaphor of what choice would produce a bigger result/effect.			
Context				
Directness	Activity on the direct side of the spectrum: interactive screen allows visitors to read questions and options. I also allow for one person to read out loud and the other to consider/choose the options.			

Table D10. Making waves prototype - Iteration 2

	Engagement	Awareness of climate conversation	Practice climate conversation	Intention toward climate actions
Hands-on/ multisensory	Interactive screen, look and feel of a game (labels include options per each question) Options provided in the screen can allow visitors for verbalization of pros and cons or weigh each option before making their decision.		Screen offers options that can promote verbal communication that could be conversation/discussion starters when participants verbalize their choices and justify them connecting to their values/relevance.	Options offered in the screen can seed ideas of intended actions in visitors.
Stories/ metaphors	The visual in the screen after selecting the choice in the form of a rock and the size of the splash this makes, it shows that different options have different impacts			
Context				
Directness				