

Charlotte Vaughn\*, Hannah Mechtenberg and Jessica Orozco Contreras

# The Language Science Station at Planet Word: a language research and engagement laboratory at a language museum

<https://doi.org/10.1515/lingvan-2024-0077>

Received April 24, 2024; accepted May 22, 2024; published online September 6, 2024

**Abstract:** The Language Science Station (LSS) is a research and engagement laboratory operating at the Planet Word museum in Washington, DC, representing a unique partnership between language researchers and a museum dedicated to language. The LSS invites Planet Word guests – ranging from local to international visitors – to participate in research studies and engage in educational activities with student language scientists from diverse academic backgrounds. In doing so, we broaden participation in the language sciences among both the researchers and the participant population. This paper outlines the goals, values, and structure of the LSS, highlighting our dual emphases on research and engagement. We focus on several aspects of the project. These include our novel multi-university researcher-museum partnership, the different considerations that we find are necessary for conducting research in a museum setting compared to the laboratory, and our training of researchers and student research assistants. The paper also provides reflections from students on their interactions with museum visitors. We share our experiences with the broader scholarly community in an effort to lower barriers for other behavioral scientists interested in combining research and engagement in public venues.

**Keywords:** public engagement; public science; science communication; human subjects research; linguistics outreach

## 1 Introduction

The Language Science Station (LSS) is a pop-up language science research and engagement laboratory operating at the Planet Word museum in Washington, DC. The LSS develops a partnership between language researchers and the museum to advance research and public understanding about the science of language. The LSS invites museum visitors to contribute to science by participating in research studies right in the museum's galleries, and to have conversations about language with budding language scientists and educators from a range of backgrounds and local universities. Conducting language research in museums, typically science museums, is not new (e.g., Wagner et al. 2015), nor is engaging the public about language (e.g., Gawne and McCulloch 2023; Price and McIntyre 2023; Wolfram 2021; this issue). However, the opening of Planet Word, a museum about language, presented a unique opportunity to bring language research to a setting where language is already the topic of conversation. Planet Word visitors may come to the museum with an interest in words, reading, and language arts, but may not be aware that language can be studied from a scientific perspective. The presence of research at the museum engages visitors in the scientific method and gives them a behind-the-scenes look at how the linguistic knowledge being shared at the museum came to be.

---

\*Corresponding author: Charlotte Vaughn, University of Maryland, College Park, USA, E-mail: [cvaughn@umd.edu](mailto:cvaughn@umd.edu). <https://orcid.org/0000-0003-0528-6899>

Hannah Mechtenberg, University of Connecticut, Storrs, USA, E-mail: [hannah.mechtenberg@uconn.edu](mailto:hannah.mechtenberg@uconn.edu). <https://orcid.org/0000-0003-1436-1846>

Jessica Orozco Contreras, University of Maryland, College Park, USA; and Harvard University, Cambridge, USA, E-mail: [jorzcoc@terpmail.umd.edu](mailto:jorzcoc@terpmail.umd.edu). <https://orcid.org/0009-0003-6077-4227>



**Figure 1:** The exterior of the Planet Word museum (*left*) and the Spoken World gallery, where visitors can “talk” to speakers of world languages (*right*). (Images by DuHon Photography, courtesy of Planet Word).

## 1.1 About Planet Word

Planet Word, which opened to the public in October 2020, is an interactive, immersive museum about language and language arts, billed as “The museum where language comes to life.” The free museum is housed in the newly restored Franklin School building, a National Historic Landmark, in downtown Washington, DC (Figure 1, *left*). Planet Word aims to “provide a space to explore words and language that is grounded in a solid understanding of language arts and science” (<https://planetwordmuseum.org/>). Some exhibits at Planet Word are specifically linguistically focused, inviting visitors to learn about the history of English, how children acquire language, and key features of world languages (Figure 1, *right*). Across all exhibits and programs, the museum seeks to educate visitors about language and its diversity from a descriptive rather than prescriptive lens. In other words, the museum affirms that there is no “right” way to participate in language and encourages visitors to celebrate linguistic diversity in its many forms. Planet Word’s galleries cater to visitors of all ages, with 10–12-year-old children a particular focus. A visit to Planet Word is a playful, fun, technology-driven participatory experience where visitors are encouraged to interact with and, as the world’s first voice-activated museum, literally talk to the museum. Visitors are therefore primed to share and to learn, so the LSS benefits from both the enhanced educational setting and the naturalistic, spontaneous environment for data collection. Finally, as a museum in the nation’s capital, Planet Word attracts local, national, and international visitors, making it an unparalleled location to interact with and collect data from a broad range of populations.

## 1.2 The Language Science Station

Launched in 2022, the LSS invites Planet Word visitors to participate in scientific data collection in fun, educational experiences that add to their museum visit. Our efforts are equally dedicated to research and to public engagement, and as such we aim to seamlessly integrate science communication with the research studies themselves. As public science becomes increasingly important, evidenced by funders’ priorities (e.g., National Science Foundation 2021) and reports from younger generations of scholars (e.g., Calice et al. 2022; Rose et al. 2020), but while scholarship on communicating basic science research remains scarce (e.g., Borchelt et al. 2022), we see endeavors like the LSS as key players in the scientific landscape moving forward.

Currently, the LSS structure includes a director, a lab manager, several teams of researchers (typically comprised of faculty and PhD students), and student research assistants (RAs; typically undergraduates and MA students). Research teams are charged with developing their own studies and educational debriefing activities, with guidance, support, and frequent input from the LSS director, as well as feedback from regular LSS-wide workshops. As our model for researcher training is becoming formalized, we are starting to onboard new research teams to develop new studies. Meanwhile, our student RAs are charged with interacting with visitors, running the studies, and conducting engagement activities.

Our project affords a variety of unique opportunities to researchers, student RAs, Planet Word visitors, and Planet Word itself. Researchers can recruit a more diverse participant pool for their studies, beyond the homogenous college student populations that tend to form the basis of work in the behavioral sciences. Undergraduate and graduate student RAs benefit from hands-on training in public-facing research and science

communication. Planet Word visitors have the chance to be a part of something bigger by contributing to science, and to talk about language with researchers. Finally, the LSS enables Planet Word to become known as a site of knowledge creation in addition to dissemination, and to establish infrastructure for partnerships with researchers into the future. Overall, we seek to raise the profile of the language sciences by showcasing a domain of science often overlooked in the public imagination.

In our first year and half, the LSS team interacted with over 3,400 Planet Word visitors, with over 2,600 study participants in 5 studies, and 800 additional conversations about language science. Our numbers are steadily increasing as Planet Word becomes more widely known. Participants have ranged from ages 3 to 89, from 33 native language backgrounds, from 41 US states and 26 countries, and from a wide range of races and ethnicities.

This paper introduces the LSS and its mission. We first explore partnership types between researchers and museums, and how the LSS expands on existing models. We then turn to some specifics about how the LSS runs and discuss how we approach research and training. We conclude by sharing observations from student RAs, and consider challenges and next steps.

## 2 Research in museums

### 2.1 Researcher-museum partnerships

In recent decades, researchers have taken advantage of museum settings as learning laboratories (Knutson and Crowley 2005), conducting research studies with museum visitors instead of bringing participants into a separate laboratory (Callanan 2012). The highly successful Living Laboratory program (Corriveau et al. 2015) has supported many researcher-museum partnerships, enabling, for example, the first author's data collection at the Oregon Museum of Science and Industry (e.g., Vaughn and Becker 2024). However, the Living Laboratory model tends to place a large logistical burden on museum personnel: the host museum typically coordinates researchers' schedule of access to the space and provides training for each research team on communicating with the public. The Living Laboratory model also focuses solely on collecting data from children, so the existing infrastructure is not designed with researchers studying other age groups, or multiple age groups, in mind.

On the other hand, researcher-led models put the logistical responsibilities on the shoulders of research personnel. This approach has been implemented in several partnerships between museums and language scientists, most notably between the Ohio State University and the Center of Science and Industry (<https://u.osu.edu/thebln/language-pod/>). Through the LSS's multi-university team of researchers (from the University of Maryland, Gallaudet University, Howard University, and growing), we expand this model by building a researcher-led partnership that extends beyond a single institution. Planet Word leadership and staff remain vital collaborators in this researcher-led model, as their endorsement of all museum-related activities is essential. Although our distributed approach presents its own challenges, its advantages include involving a wider range of researchers and developing guidance that can generalize beyond individual universities.

### 2.2 Language research in museum settings

Researchers working in informal learning settings encounter quite a few differences from running studies in the lab or online (e.g., Sobel and Jipson 2015). To ensure that research complements, and does not detract from, the educational and participatory experience that museums provide, researchers cannot conduct business as usual: typical lab-based studies are not well suited for visitors at a museum. In museums, the noise and distractions competing for visitor attention mean that researchers cannot presume the same type of control they would in a laboratory. Methodologies that require very quiet backgrounds or extended focused attention, for example, are not ideal for this environment. To keep participants' attention, researchers must design studies that are short, engaging, and fun. Further, museum visitors, especially in a tourist destination like Washington, DC, span a range of ages, language backgrounds, levels of education, and so on. So, researchers cannot adopt the one-size-fits-all

approach that may be routine on a university campus, including expectations that all participants can read detailed experiment instructions. In general, researchers in museum settings must show flexibility in how they conduct their research while keeping in mind the various motivations that museum visitors might have to participate in scientific research – from “it could be fun” to “I want to learn more.”

Identifying the key differences between what works in a lab setting versus in a museum informs much of how the LSS operates. We aim to collect the kinds of data that are often hard to do in the laboratory but that are crucial to the field, including from more diverse populations and in a real-world environment (and, part of our project entails identifying which types of empirical questions and methods are most appropriate for the museum). As the research we conduct is designed to take full advantage of the museum setting, we view the points of divergence from the norms of the lab as benefits to our project and to our science more broadly.

### 3 Our research and public engagement activities

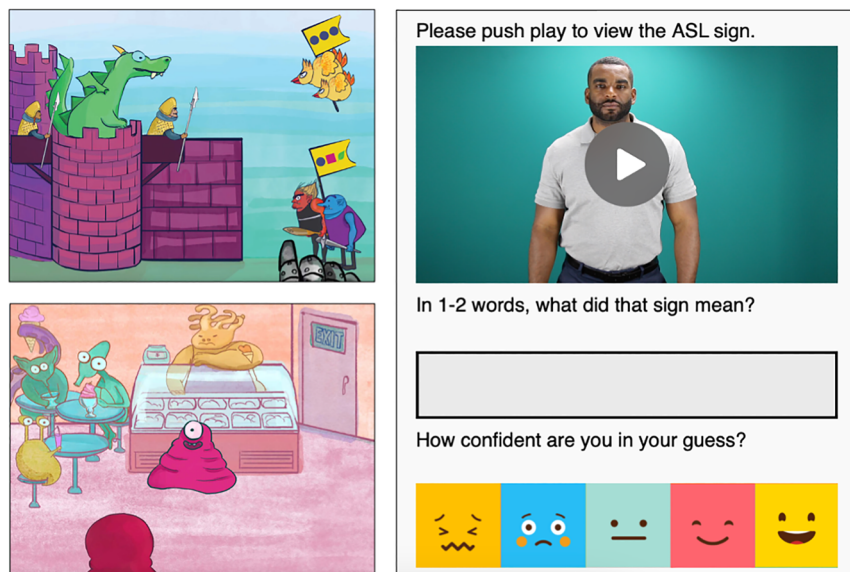
#### 3.1 Our research studies

As of spring 2024, we have debuted five studies at Planet Word, with four more about to launch, and others in earlier development. We aim to offer studies that span a range of subdisciplines and methodologies. This not only enables us to learn which kinds of experiments are well suited (or less well suited) to the museum environment, but ensures that we present museum visitors and student RAs with a broad introduction to the language sciences. Our studies already underway or completed have focused on: language prediction in comprehension (Lee et al. 2023), iconicity in the guessing (Kirst et al. 2022) and teaching of American Sign Language (ASL) signs, semantic networks in the mental lexicon (Domanski et al. 2024), and concussion’s effects on language.

So far, our approach has been for each research team (faculty and graduate students) to take the lead on a study’s development, design, and implementation, with frequent feedback and input from the director and larger LSS group. Studies are designed with our existing shared equipment in mind (i.e., laptops, iPads, microphones, etc.) to minimize additional hardware needs and allow for interchangeability of devices across shifts. The project has a shared Institutional Review Board protocol (housed at University of Maryland, with reliance agreements with other institutions), and new procedures and researchers are added as necessary. Our consent process for both adults and minors requires verbal consent, but does not require a written signature from adult participants or children’s parents or guardians, as the additional written documentation would cut into the brief time we have with visitors. Beyond its primary ethical purpose, we find the verbal informed consent process to be beneficial for both student RAs and participants as a point of insight into the practices of human subjects research.

Although we have some bespoke experimental interfaces that are truly game-like (see Figure 2, *left*), we strive for simplicity in study design and implementation, typically opting for straightforward off-the-shelf software platforms like Qualtrics (<https://www.qualtrics.com/>) and PClbex (<https://doc.pclbex.net/>) but dressing up the presentation to be fun and visually appealing (see Figure 2, *right*). Extensive piloting determines factors like the optimal number of trials and composition of stimuli so as to balance brevity and accessibility with rigor and statistical power. So far, a range of tasks have worked well. For example, from our studies E is for Expert (led by Dr. Yi Ting Huang at University of Maryland; Domanski et al. 2024) and Race the Robot (led by Dr. Colin Phillips at University of Maryland; Lee et al. 2023), we have learned that collecting production recordings in the museum’s galleries has been more successful than originally expected with our head-mounted mic setup. Although the resulting audio data are not intended to undergo acoustic analysis for fine phonetic research, they have been more than sufficient for automatic transcription and for response time analysis.

We briefly describe one study here as an example. Guess the Story, led by Dr. Deanna Gagne at Gallaudet University, asks whether the way that ASL is taught influences learners’ attitudes toward its ease of learnability. Across two between-subjects conditions, the study teaches participants three ASL signs using either iconic or arbitrary descriptions. A series of short tasks provides a variety of dependent measures, including phonological accuracy (as coded by student RAs) in producing the signs they learned, accuracy of noticing the signs in a



**Figure 2:** Screenshots from two LSS studies: Language and Concussion (left two panels) and Guess the Sign (right panel). The Language and Concussion app was developed by the University of Maryland, the Universidad de los Andes, and Passy-Muir.

subsequent video-presented story in ASL, and attitudes about ASL’s learnability before versus after the experiment. The accompanying engagement activity and take-home materials challenge the commonly held belief that sign languages are easier to learn than spoken languages, while encouraging ASL learning and introducing to visitors the concepts of transparency, iconicity, and arbitrariness in language. Visitors are eager to share with us what they already know about sign language, and report enjoying learning about ASL, including some actual signs.

Our upcoming studies include introducing new research methodologies like neuroimaging, studies that address public understanding of topical language-related issues like generative AI, and studies that invite visitors to participate in groups.

### 3.2 Our engagement activities

For each research study, we develop an accompanying engagement activity that typically takes the form of an extended educational debriefing conversation. This model differs somewhat from many other researcher-museum partnerships, where engagement activities tend to be designed as stand-alone activities that are not tightly yoked to research studies themselves. We prioritize developing these high-quality educational conversations equally to developing the actual studies.

In some cases, the majority of participant education is done in the lead-up to the study, or the “pitch” to prospective participants, where the rationale for the study itself (i.e., the idea of a norming study) creates points of connection with visitors. In most cases, however, the bulk of participant education takes place following the experiment. This way, experimenters can reference particular stimuli or parts of the study in their debriefing conversation with visitors. For example, our study *Race the Robot* (Lee et al. 2023) is a speeded version of a cloze task that includes sentence fragments that are designed to create tempting but unlikely completions such as “This is the bee that the girl ...” “... stung.” RAs are seated next to participants during the task, allowing them to note which completions participants made. RAs then use this shared experience to facilitate a conversation with the participant about why they may have responded in the ways that they did. Overall, we find that pairing research and engagement is synergistic: building from the common ground of shared activities leads to interactive, meaningful conversations around our science.

Some visitors may not wish to participate in data collection or may not be able to do so – for example, a minor visiting the museum without a parent or legal guardian to consent – but are still interested in learning about



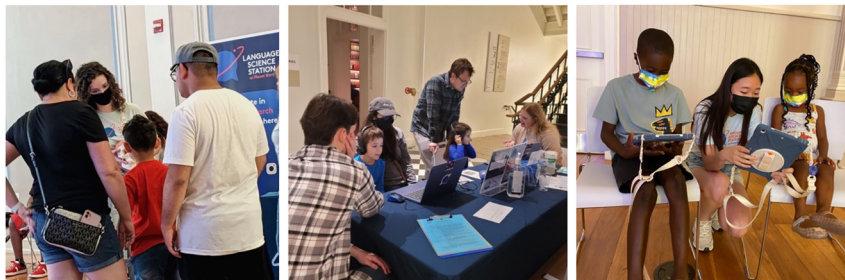
language science or what we are doing. For these cases, called “educational opportunities” (Corriveau et al. 2015), we have versions of each study that run without collecting participants’ data and/or stand-alone versions of the debriefing that we can present (similar to the demos described in Wagner and McKee 2023). Regardless of the type of interaction, we target 10 minutes or less as our total interaction time with a visitor (research plus engagement), unless the visitor is interested in sticking around longer.

We fully expect that no two conversations with visitors will be alike, due in part to the unique combination of the visitor’s and the LSS student RA’s interests, experience, and curiosity. We encourage student RAs to flexibly approach each interaction. For example, the Language and Concussion study, led by Dr. Rochelle Newman at University of Maryland, uses animated language games to collect norming data from participants without a history of concussion to better diagnose concussed children’s readiness to return to school. In addition to having an eye-catching brain and skull model at our table to facilitate engagement (affectionately dubbed “Jiggly” by a few child visitors), student RAs are trained in a range of related topics that may come up during conversations about the study: what concussions are, how they impact the brain, what brain areas are involved in language, how concussions can affect language, how concussions are typically diagnosed, the lack of extensive concussion research on children, what a norming study is, and information about the language phenomena addressed in each of the games (e.g., phonological awareness, syntactic structure). This example illustrates how our debriefing conversations not only address the narrow research question specific to the study but are also a chance to engage with visitors about language science-related topics relevant to their own lives and about how language science is done more broadly.

Regardless of the study and the accompanying engagement activity, one of the most common questions we get from visitors is about the results from our research. If a study’s analysis is still ongoing (or yet to start), we welcome this question as a chance to talk about how the researchers plan to analyze the data (e.g., coding procedures, statistics, etc.), opening the door for a discussion about the scientific process more generally. Our website (<https://sites.google.com/umd.edu/planetwordresearch>) also features links to posters and papers that disseminate the findings of our studies, accompanied by public-facing, jargon-free descriptions of those findings.

### 3.3 Logistics

We set up our studies as pop-up stations at various locations around the museum (see Figure 3). We choose locations that are well trafficked, but out of the way of permanent museum exhibits. Our student RAs approach guests who seem to be curious, but never pressure anyone to participate. We aim for every museum visitor who is interested in participating to have an educational, fun, and positive interaction with our team, regardless of their age, language background, ability, or which activities they partake in. This means that we strive to offer at least one study at a time that is accessible to any visitor of any age – whether they are a reader or not, are hearing or sighted or not, or are a native English speaker or not.



**Figure 3:** Student research assistants engaging with visitors as they participate in our studies in multiple locations throughout the museum.

## 4 Training

### 4.1 Training researchers

Going into the project, we expected that the researcher learning curve for museum-friendly study design would largely consist of methodological considerations, like how to decrease the number of trials required, designing stimuli appropriate for a wide age range, and the gamification of the design. Certainly, these issues are a major part of our process in workshopping new studies, particularly the need to land on a procedure that works as well for 7-year-olds as it does for 70-year-olds. More importantly, however, we have found that researchers moving from a lab to a museum setting must shift their mindsets beyond merely shifting their methods: the LSS encourages researchers to focus on participants' experiences in their studies above and beyond the data that those participants provide. We find that when designing studies guided by this mindset, the methodological and technical decisions follow.

As discussed above, lab-based research skills do not immediately translate to the museum environment. Seasoned experimentalists used to working in more controlled settings may have a hard time adapting to new ways of approaching research. To ensure an excellent visitor experience while maintaining rigorous scientific standards, our studies and accompanying engagement activities are subject to quite a bit more iteration than many researchers (perhaps especially senior researchers) are used to. First, the LSS director and our larger LSS group regularly provides feedback to each research team on their study and engagement activity at multiple points in the design process. Also, feedback from our first cohorts of student RAs has been increasingly helpful in developing new study designs, as they have acquired intuitions about what works better or worse in practice. At first, we noticed some apprehension among students offering their suggestions to the research teams, but confidence appears to grow as we reinforce the value of their expertise as experienced professionals in interactions with museum visitors. Planet Word leadership also provides feedback to the research teams and signs off on studies before they are ready to debut at the museum. Finally, and crucially, we request that research teams be willing to nimbly make changes to their study designs to make visitor interactions as smooth as possible, even shortly after data collection with visitors has begun (e.g., to shorten too-long instructions or to streamline the experiment flow). This means tolerating potential data loss in the short term in the interest of better participant interactions in the long run.

Thus far, introducing researchers to principles of science communication (following, e.g., Besley and Dudo 2022), plus our iterative feedback process, has made up the majority of our researcher training. The LSS is now formalizing our trainings for researchers new to this domain but outside the initial LSS group. We plan to make our best practices available as the project continues.

### 4.2 Training student research assistants

To maintain a regular presence at Planet Word and to provide unique educational experiences, we recruit and train undergraduate and graduate students to run the studies and interact with the public. In essence, these student RAs are the face of the LSS. Thus far, student training has been done via an intensive six-week summer course (see Figure 4). Using a course to facilitate student training was chosen for several reasons – to ensure dedicated and consistent involvement from students, to offer formal credentialing for students interested in having these skills noted on their transcript, and also to guarantee that accessibility options such as ASL interpreting could be provided. We offer need-based stipends to offset the cost of the summer course. And, after completing the training course, students are eligible to continue their activities at the museum throughout the year in paid part-time RA positions.

The project's values dictate the design of the training, where equal focus is placed on research acumen (e.g., research design, ethics, scientific background) and science communication (e.g., principles from communication, informal science learning). The course balances providing the acute skills necessary for running our specific



**Figure 4:** The summer training course in action.

studies at Planet Word with more general transferable skill-building and career preparation. This is accomplished through activities like one-on-one career mentoring with current PhD students in the language sciences, guest lectures from museum and science communication professionals, improv-inspired activities to build communication skills and self-confidence, and students' formative and summative assessments of themselves and their peers.

In our first two cohorts (Summer 2022 and 2023), we trained 20 undergraduate and four graduate students from seven Washington, DC–area universities (including three minority-serving institutions), from a range of degree fields (from linguistics to anthropology to women's studies to hearing and speech sciences to psychology) and language backgrounds (e.g., ASL, Spanish, Nepali, Korean). This range in academic background and level initially seemed like a challenge: how will a short summer course be able to equally prepare all students when they have such varied prior experiences? That initial worry has turned out to be less of a problem than we expected, largely because the students have been so effective at learning from one another. We now view the peer connections made in the course as one of the most successful aspects of the project. For example, interactions with peers from Gallaudet have inspired increased interest in ASL among many non-signing students.

Thus far, around half of the students from each cohort have opted to continue with the LSS beyond the summer. Several students have even stayed involved across multiple years, growing their commitment to serve as, for example, the LSS Lab Manager and as mentors to incoming cohorts.

## 5 Student and visitor experiences

A founding principle of the LSS was to broaden participation in the language sciences both among the researchers and students we train, and among those who participate in our studies. Through our multi-university partnership, the LSS encourages the participation of minority students that are traditionally underrepresented in the language sciences. Among the many success stories from our initial cohorts, we have supported several students who have assisted in designing stimuli for future studies; a Deaf student fully participating in the course and in all of our activities through ASL interpreters; and a rising PhD student designing and running their own study.

As well as broadening the field of scientists and trainees involved in language science, our data collection at Planet Word has also diversified the participants in language science research. Because of Planet Word's setting and its free admission, our studies benefit from the diversity of ages, languages, education levels, races, and abilities of the Planet Word visitors who interact with us. As mentioned above, we have talked to visitors of all



**Table 1:** Student research assistants’ reflections highlighting interactions with visitors.

---

“I talked for a little while about machine learning and how it diverges from the way that people process language and interact with words. Clearly he knew a lot about the topic and it helped make a shared concept to compare human cognition against. After the study he was very curious and I saw him explaining it to the rest of his family later.”
“One participant in particular told me after the study that she had an aunt who was deaf but ... until this study never internalized how difficult ASL is!”
“I got to talk to a whole family at the same time – 2 kids, mom, nanny, grandma, and a few others. It was a lot of fun to talk to everyone at the same time as they learned the signs. I saw them practicing the signs with each other after the shift ended too!”
“We had a lot of interactions today with visitors who were eager to participate in both studies on the third floor! This created the opportunity to connect to language science as a whole (I had one participant say that they’d never considered exactly how linguists study the nature and function of language prior to today) after debriefing about the specific concepts of each study.”

---

**Table 2:** Student research assistants’ reflections highlighting their own performance.

---

“I am feeling more confident in my study pitch compared to the beginning of the shift and I’m feeling optimistic this will continue to improve with more practice.”
“I had such a good time running this study! It consistently leads to great conversations and I kept overhearing people keep talking about their experience to their friends/family as they walked away. I think I can definitely get smoother with my script and ask people more questions that lead into the main messages instead of sticking to the one I’ve been settling into.”
“I got to do Guess the Story with a group of 10 kids/teens who admittedly are probably the most shaky demographics for me (vs. individuals/adults). I was expecting them to lose interest pretty quick and have a hard time engaging with so many people but it went really well! Everyone was so excited to learn, participate and have the experience with each other. I feel like I really surprised myself with how well it went, and made me really reflect on the progress I’ve made during this course ...”
“... It felt pretty busy today, but not overwhelming ... I think I did a good job conveying the main points of the study; I got a lot of lightbulb moments :D”

---

ages, and from a breadth of language backgrounds that would be hard to match in conventional participant recruitment pipelines, though our participants do still skew toward being highly educated. Expanding the participant pool is important for many reasons, including being able to make more representative inferences about human cognition (e.g., Prather et al. 2022). The diversity of our participants also means that we can talk about language science topics with many who may not have encountered the field otherwise.

Detailing our formal evaluations of LSS’ impact on Planet Word visitors, student RAs, research teams, and Planet Word staff is beyond the scope of this paper. But, the success of the LSS extends beyond metrics, of course. Here we highlight some of our interactions with visitors as captured in excerpts from student RAs’ shift reports, written immediately after each block of time they spend working with visitors. Some comments emphasize visitors’ experiences (Table 1) and others reveal students’ self-assessments (Table 2).

As is evident in many of the reflections in Table 1, a consistent highlight for those of us engaged in this work is when visitors show continued interest through questions and conversation, and when we witness them excitedly sharing their experience with loved ones. And, in Table 2, student RAs’ growing competency and confidence in science communication is readily apparent.

## 6 Challenges and going forward

As with any new endeavor of this scale we have encountered several challenges. Some challenges are of the teaching-old-dogs-new-tricks variety, as described above. Indeed, a core goal of the project is to provide scaffolding and support for researchers to take their work to the museum environment. Adopting different methods has proven to be relatively straightforward in comparison to the shift in mindset required for doing collaborative science in a way that values participants’ experiences first and foremost. We are approaching this challenge in

multiple ways. Perhaps the most notable is that our team is changing the typical experiment design workflow from what is often done in the lab: we aim to allot ample time in the study development timeline for extensive iteration with museum visitors to refine how our interactions flow during the experiment and educational debriefing.

Other challenges have arisen from the novel structure of the project, which straddles many universities and a museum. The precarity of grant funding and the dependence of the project on a few key personnel create challenges to sustainability. Further, along with the benefits of our multi-university partnership for fostering new collaborations and increasing our reach comes logistical complexities like advertising the training course, facilitating student enrollment in the course (via the DC-area consortium or visiting student mechanisms), and onboarding for paid positions within the LSS. These logistical difficulties are not insurmountable but do take considerable effort to navigate.

We hope that this paper and the continued output from our project will eventually lower the barrier to entry for other behavioral scientists interested in combining research and engagement in public settings. As we refine principles for designing fun and interactive studies that still maintain scientific rigor, and for developing effective accompanying educational activities, we will share our experiences with the larger research community. In addition to the scientific advances that will result from these and all studies we run at Planet Word, we intend for the resources and infrastructure that the LSS creates to benefit the field at large, and by extension our field's ability to connect with the public.

**Acknowledgments:** This work was supported by the National Science Foundation grant BCS-2116959 to CV. The authors would like to acknowledge the critical contributions of all the LSS team members (listed here from the LSS's inception through spring 2024), including Ge (Stella) Huang, Deanna Gagne, Yi Ting Huang, Patrick Plummer, Colin Phillips, Rochelle Newman, Laura Wagner, Jan Edwards, Caitlin Eaves, Julie Cohen, Marjorie Bates, Sofia Bendaña, Lillian Berggoetz, Deja Bulluck, Jen Chesney, London Dixon, Sophie Domanski, Chelsea Fuller, Tessa Goldlust, Liam Graff, James Harvey, Katherine Howitt, Ivy Huang, Minsol Kim, Yuri Kim, Desirée Kirst, Bethany Kuo, Eun-Kyoung (Rosa) Lee, Jocelyn Martinez, Sarah Nam, Tal Ness, Skylar Norton, Rebecca Roberts, Lauren Salig, Thomas Sims, Craig Thorburn, Stacey Torbeso, Nichole Tramel, Melissa Stockbridge, Maya Younes, Valquiria Zango, and Andrea Zukowski. We also gratefully acknowledge the support of Planet Word leadership and staff past and present, including Ann Friedman, Patty Isacson Sabee, Rebecca Roberts, Emily Gref, Caitlin Miller, Keith Stipes, Adriana Licon, Talya Mackell, and Nikki DeJesus Sertsu. Finally, we thank all of the Planet Word visitors who have shared their time and insights with us.

## References

- Besley, John C. & Anthony Dudo. 2022. *Strategic science communication*. Baltimore: Johns Hopkins University Press.
- Borchelt, Rick, Keegan Sawyer & Brooke Smith. 2022. *Charting a path for public engagement in basic science: A prospectus* (Report for the Department of Energy Office of Science and the Kavli Foundation as part of the Science Public Engagement Partnership). <https://doi.org/10.17605/OSF.IO/PYJAX>.
- Calice, Mikhaila N., Becca Beets, Luye Bao, Dietram A. Scheufele, Isabelle Freiling, Dominique Brossard, Noah Weeth Feinstein, Laura Heisler, Travis Tangen & Jo Handelsman. 2022. Public engagement: Faculty lived experiences and perspectives underscore barriers and a changing culture in academia. *PLoS One* 17(6). e0269949.
- Callanan, Maureen A. 2012. Conducting cognitive developmental research in museums: Theoretical issues and practical considerations. *Journal of Cognition and Development* 13(2). 137–151.
- Corriveau, Kathleen H., Becki Rebecca Kipling, Samuel Ronfard, Marta C. Biarnes, Brittany M. Jeye & Paul L. Harris. 2015. The living laboratory® model: A mutual professional development model for museum-based research partnerships. In David M. Sobel & Jennifer L. Jipson (eds.), *Cognitive development in museum settings*, 65–83. New York: Routledge.
- Domanski, Sophie, Rachel Rudinger, Marine Carpuat, Patrick Shafto & Yi Ting Huang. 2024. Assessing common ground via language-based cultural consensus in humans and large language models. Proceedings of the 2024 Meeting of the Cognitive Science Society. Rotterdam, Netherlands, July 2024.
- Gawne, Lauren & Gretchen McCulloch. 2023. Communicating about linguistics using lingcomm-driven evidence: Lingthusiasm podcast as a case study. *Language and Linguistics Compass* 17(5). e12499.

- Kirst, Desirée, Marjorie Bates, Laura Wagner & Deanna Gagne. 2022. Reimagining language research: Museum outreach and engagement during COVID-19. Talk presented at the High Desert Linguistics Society Conference, Albuquerque New Mexico, November 2022.
- Knutson, Karen & Kevin Crowley. 2005. Museum as learning laboratory: Developing and using a practical theory of informal learning. *Hand to Hand* 18(4). 4–5.
- Lee, Eun-Kyoung Rosa, Katherine Howitt, London Dixon, Tal Ness, Masato Nakamura, Hanna Muller & Colin Phillips. Alignment between adult and child predictive processing dynamics: Evidence from a gamified cloze study in a museum. Paper presented at the 36th annual Human Sentence Processing Conference, Pittsburgh, PA, March 2023.
- National Science Foundation. 2021. Dear colleague letter: A broader impacts framework for proposals submitted to NSF's social, behavioral, and economic sciences directorate (NSF 21-059). <https://www.nsf.gov/pubs/2021/nsf21059/nsf21059.jsp> (accessed 8 April 2024).
- Prather, Richard W., Viridiana L. Benitez, Lauren Kendall Brooks, Christopher L. Dancy, Janean Dilworth-Bart, Natalia B. Dutra, M. Omar Faison, Megan Figueroa, LaTasha R. Holden, Cameron Johnson, Josh Medrano, Dana Miller-Cotto, Percival G. Matthews, Jennifer J. Manly & Ayanna K. Thomas. 2022. What can cognitive science do for people? *Cognitive Science* 46(6). e13167.
- Price, Hazel & Dan McIntyre. 2023. *Communicating linguistics: Language, community and public engagement*. Abingdon: Routledge.
- Rose, Kathleen M., Ezra M. Markowitz & Dominique Brossard. 2020. Scientists' incentives and attitudes toward public communication. *Proceedings of the National Academy of Sciences of the United States of America* 117(3). 1274–1276.
- Sobel, David M. & Jennifer L. Jipson. 2015. *Cognitive development in museum settings: Relating research and practice*. New York: Routledge.
- Vaughn, Charlotte & Kara Becker. 2024. Documenting the emerging social-semiotic landscape in children ages 5 to 12. *Language & Communication* 95. 16–30.
- Wagner, Laura & Cecile McKee. 2023. *How to talk language science with everyone*. Cambridge: Cambridge University Press.
- Wagner, Laura, Shari R. Speer, Leslie C. Moore, Elizabeth A. McCullough, Kiwato Ito, Cynthia G. Clopper & Kathryn Campbell-Kibler. 2015. Linguistics in a science museum: Integrating research, teaching, and outreach in a language sciences research lab. *Language and Linguistics Compass* 9. 420–431.
- Wolfram, Walt. 2021. Sociolinguistic variation and the public interest. *Cadernos de Linguística* 2(1). 1–25.