

buckeye language network
the ohio state university

Prehistoric Voices Demo

Formative Evaluation

COSI Labs in Life Language Pod

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Background

The Language Pod is part of the Labs in Life in COSI's Life exhibit. It serves as a research space for professors and students at The Ohio State University working in the field of linguistics, and allows COSI visitors to participate in and observe real scientific research. The Language Pod also develops and operates program carts on linguistic concepts for COSI visitors in the main hall outside the Life exhibit. The cart demos are run by Ohio State students as part of a course at the university and explore a wide range of linguistic concepts.

Program carts consist of short, educator-facilitated activities on mobile carts and are conducted outside of the main exhibit spaces. They are regularly operated throughout the halls of COSI by the Labs in Life, as well as COSI staff and volunteers. They can be conducted anywhere in the museum and they are operated for typically 30 minutes to two hours at a time, as they require a demonstrator to facilitate the activity and explain concepts to visitors. Visitors chose whether to engage in the experience or not as they walk through the museum. In some cases they stop at the cart with the intention of engaging in the specific program cart experience, in others something about the demo catches their attention and they come over to explore it.

Prehistoric Voices Demo

Prehistoric Voices is a new cart demo developed for the Language Pod that explores how scientists reconstruct the sounds of dinosaurs from fossil remains and phylogenetic relationships.

Pop culture has always depicted dinosaurs as ferocious, roaring beasts whose impressive vocalizations could nearly blow the leaves off of the trees they towered over. However, these sounds are more a production of Hollywood spectacle than scientific fact. More accurate reconstructions of dinosaur vocalizations have looked to the connection between dinosaurs and their modern decedents, birds, for answers. Though the extreme unlikeliness of soft tissues to fossilize means that we many never know for sure, dinosaurs likely made more retrained noises than those we have come to associate with them.

This demo teaches visitors this surprising lesson about dinosaur vocalization, as well as offers an opportunity to talk about the reconstruction of extinct animal vocalizations through both physical features and phylogenetic relationships.

The learning objectives of the demo include:

- **Main objective:** By observing and estimating different anatomical features of fossilized remains and looking at phylogenetic relationships, scientists can reconstruct what extinct organisms may have sounded like.
- Dinosaurs likely sounded a lot more like their avian descendants than the ferocious, roaring beasts they are often depicted as.
- Reconstructing the sounds of extinct organisms is very difficult because of the complex variables involved in speech production and the fact that soft tissues do not fossilize.

- Different anatomical features, such as elaborate nasal crests, allowed dinosaurs to create unique sounds to communicate with one another.

The demo is conducted using a program cart. Visitors listen to a series of three sounds: a movie-style T. Rex roar (created using an elephant sound), an ostrich call, and a modern scientific reconstruction of a dinosaur sound. As they listen they use flash cards with pictures of a T. rex, an ostrich, and an elephant to guess which sound comes from which animal. The demonstrator checks their guesses at the end and replays the sounds, as well as a video for the ostrich call, so that visitors can associate the sounds with the proper animals. They conclude by talking about how scientists can use calls from birds like the ostrich to make estimates about how dinosaurs may have sounded, a much more scientific approach than Hollywood sound designers using elephant noises for dramatic effect.



Evaluation

Objectives

The objective of this evaluation was to understand visitors' reactions and learning outcomes

regarding Prehistoric Voices and to utilize that information in the further development of the demo.

This evaluation aimed to observe and understand:

- Whether visitors understood how to complete the activity
- How visitors physically interacted with the activity
- Whether the activity difficulty and length were appropriate for COSI visitors
- Whether visitors found the activity enjoyable
- Whether the intended educational message of the demo was coming across

Methodology

This evaluation consisted of a brief verbal questionnaire conducted with visitors after completing the demo, as well as the taking of observational notes on visitor demographics and activity experiences by the demonstrator after each trial. The questionnaire was given to the group as a whole, thus each response reflects the experience of the collective group, regardless of size or makeup. All demos and questionnaires were conducted by the author.

The demo was done on a program cart, and the evaluation questionnaire was conducted at the cart immediately after the completion of the activity. The cart was located in the hallway outside of the Life exhibit and operated during regular COSI hours on weekends. The evaluations were conducted once a week from February 2018-March 2018.

Participants were recruited when they came over to try out the demo. Before the demonstrator began, they told the visitors that the demo was currently in development and asked if they would be willing to answer a few brief questions when they had completed it to help further improve the experience. They were told that if they did not want to answer any questions, or wanted to stop answering questions at any point, they were allowed to do so. If visitors agreed to be surveyed they were asked the questions verbally and the demonstrator recorded their answers. The demonstrator also made observational notes on the experience. If visitors declined to be surveyed, the demo was still conducted but no questions were asked, though the demonstrator made notes reflecting on the experience. The demonstrator never referred to herself as the creator of the activity and described the demo as though she was testing it for the Language pod to avoid influencing visitor's responses.

The questionnaire gathered demographic information including number of visitors doing the demo (the demo was almost always done by a single group of visitors who had come to the museum together, e.g. a family, a couple), the ages of the visitors in the group, and the group's relationship to one another. This information was gathered/estimated observationally by the demonstrator and was not specifically asked of the visitors. It was collected to determine whether the activity was effective for different ages and group makeups. Activity related information was also recorded in order to determine visitors' ability to do the activity and interest in continuing with it. The post-activity visitor questionnaire consisted of four open-ended questions. They were meant to assess visitor's enjoyment of and ability to complete the activity, as well as whether the learning objectives of the demo were coming across as intended. After completing the demo and,

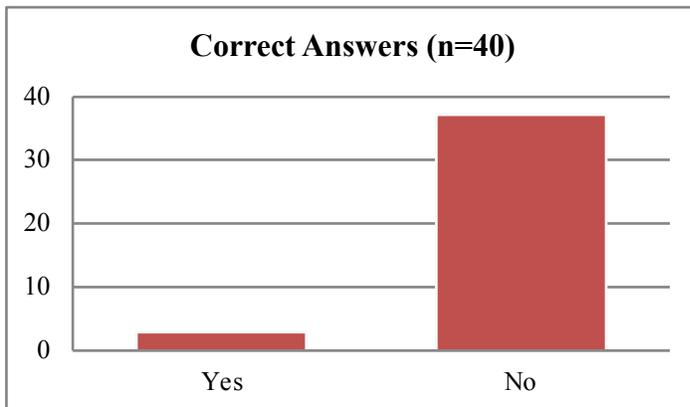
if conducted, the questionnaire, the demonstrator answered a series of nine questions reflecting on the experience. They recorded the logistics of the demo, if and how visitors completed the activity, and the level of engagement groups of visitors had with one another.

Results

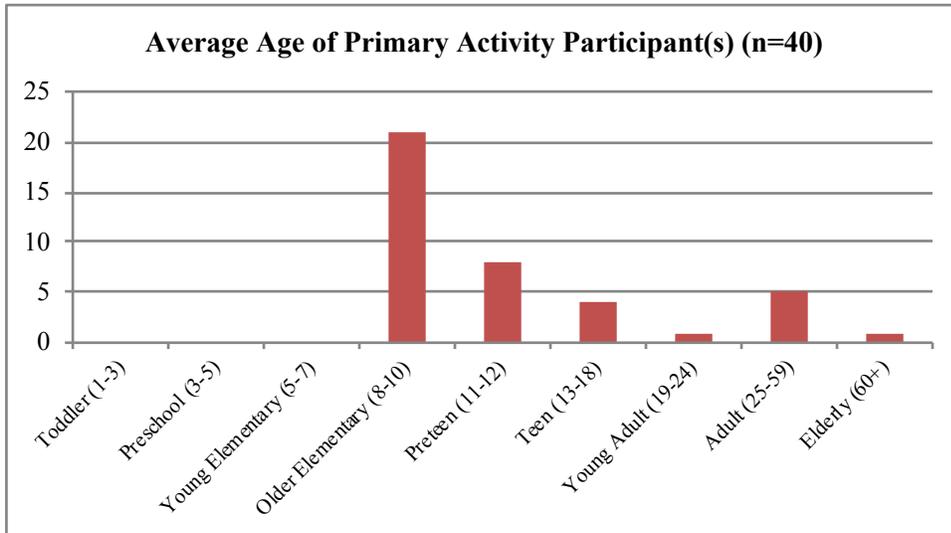
The following results come from 40 trials of the Prehistoric Voices demo. Demonstrator notes were taken for each trial. Visitors agreed to and questionnaires were conducted for 39 of the trials.

General

Overall, participants were very successful at completing the activity. All participants were able to complete the activity by themselves or with some assistance. While most participants failed to correctly match the sounds to the animals, such confusion added important emphasis to the demo's message and was not a problem in terms of successfully running the demo.

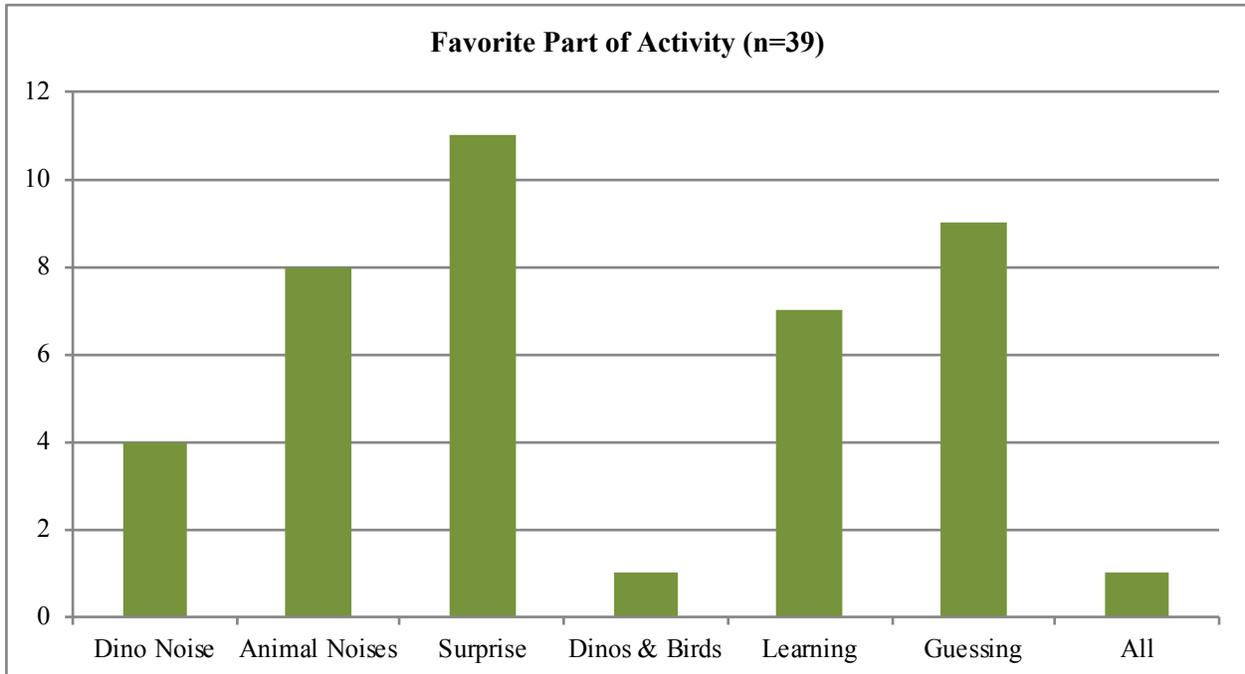


A range of different groups, from individuals to families, did the Dinosaur Communication demo. Participant's ages skewed older than average for this evaluation, with the highest concentration around ages 8-10. This should be kept in mind across the following results, as the primary audience for the cart is likely to include those in the young elementary (5-7) range as well.



Participant Post-Activity Questionnaire

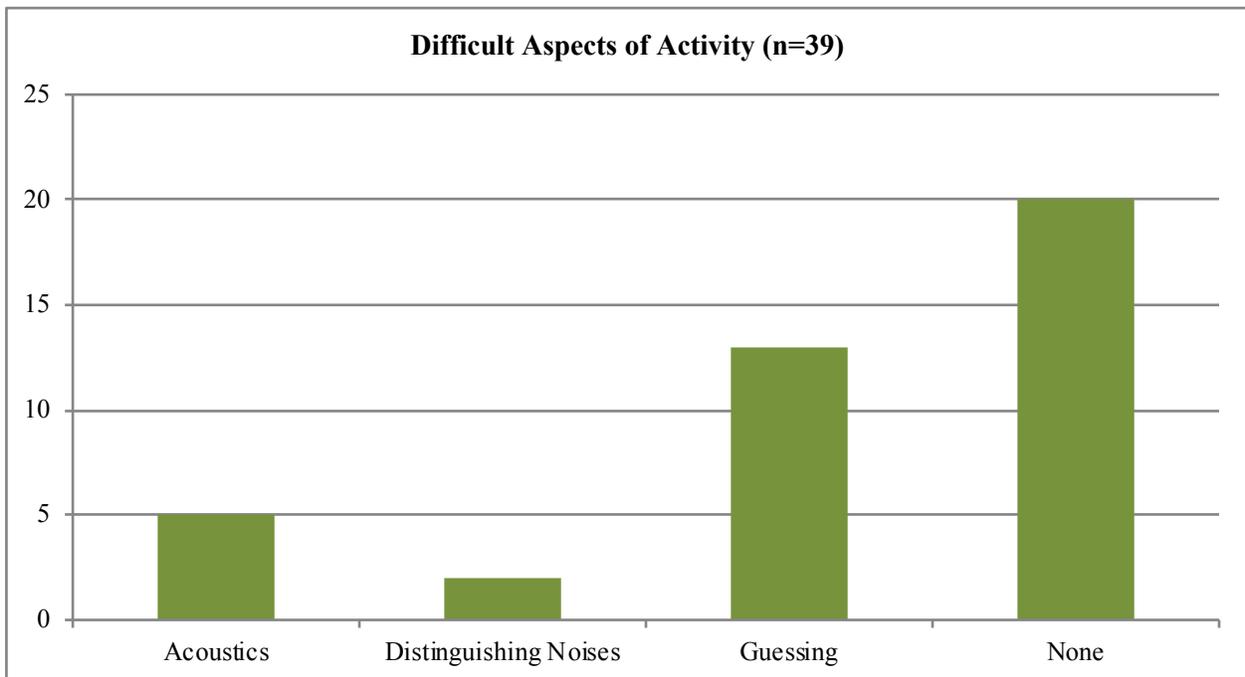
Participant's favorite parts of the activity tended to vary by personal ability or interest, but the information was collected to see what aspects of the activity were enjoyable and which if any, should be expanded upon to promote greater enjoyability and engagement. The most popular aspect of the demo was the "surprise" of finding out that T. rexs did not make the sound participants thought, which was encouraging as that is the aspect that gets the primary message across. Matching up the noises to the animals and hearing the animal noises were also popular, which showed that participants had an enjoyable time completing the activity. Fewer participants expressed an explicit interest in hearing the scientifically reconstructed dinosaur noise and learning about links between birds and dinosaurs, which may have come from a lack of interest in or understanding of the more complex levels of the activity.



The following terms were used to group and code open-ended responses:

- **Dino Noise** – hearing what a dinosaur may have sounded like
- **Animal Noises** – hearing animal noises
- **Surprise** – the surprise of the T. rex noise not being what they thought it was
- **Dinos & Birds** – learning that birds and dinosaurs are related
- **Learning** – learning something new
- **Guessing** – trying to figure out which sound matched which animal
- **All** – enjoyed the entire demo or the demo as a whole

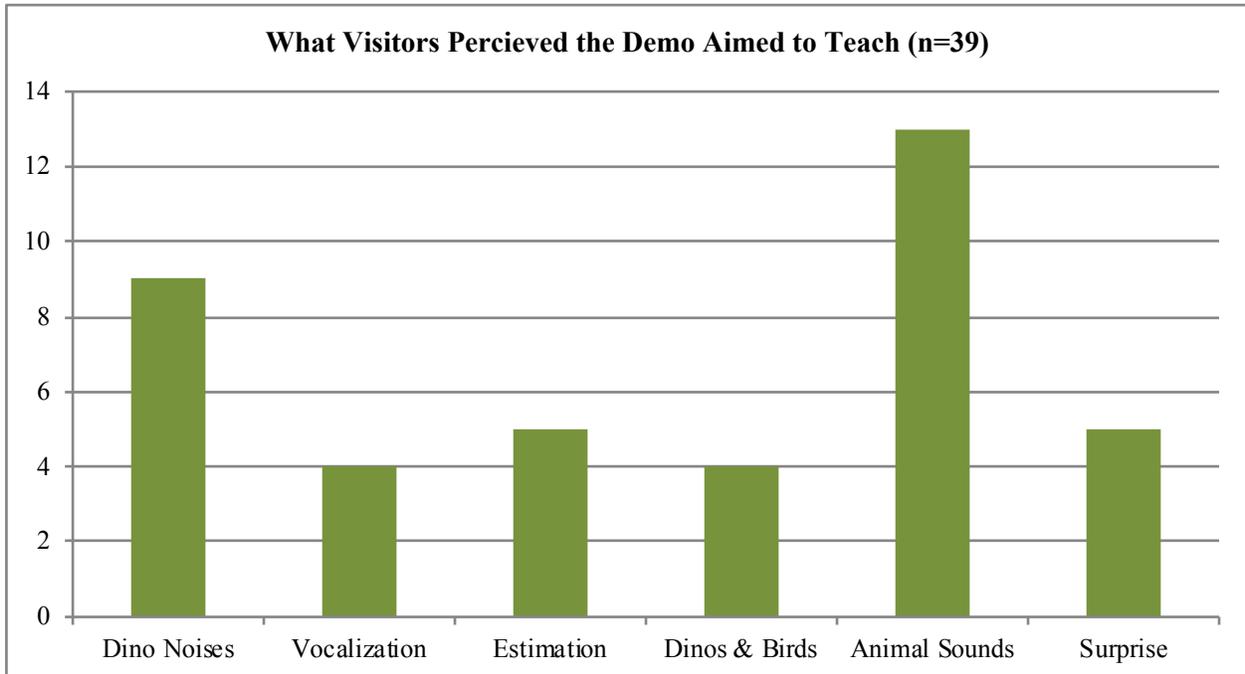
Participants were asked whether they felt any parts of the demo were difficult or confusing in order to determine if anything was an obstacle to engagement and thus should be altered or removed from the demo. Many participants did not have any issues or expressed that the assigning of the sounds to the different animals was difficult, which was simply intended as part of the activity. However, some participants did say that they had trouble hearing the sounds in the often loud environment of the COSI hallway as well as telling the sounds apart, which are certainly things that should be accounted for moving forward.



The following terms were used to group and code open-ended responses:

- **Acoustics** – hearing the speaker in the hallway
- **Distinguishing Noises** – noises are hard to tell apart
- **Guessing**– figuring out which was which
- **None** – no aspect of the activity was particularly difficult

Visitors were asked in the questionnaire what they felt the demo was trying to get them to learn. The most common responses included what sounds different animals make and more specifically what sounds dinosaurs were likely to have made. The latter of these two, as well as responses along the lines of how animals vocalize, how scientists reconstruct vocalization, and how birds and dinosaurs are linked aligned well with the educational goals of the demo, and their mention by participants is encouraging when it comes to creating an activity that successfully communicates these ideas.

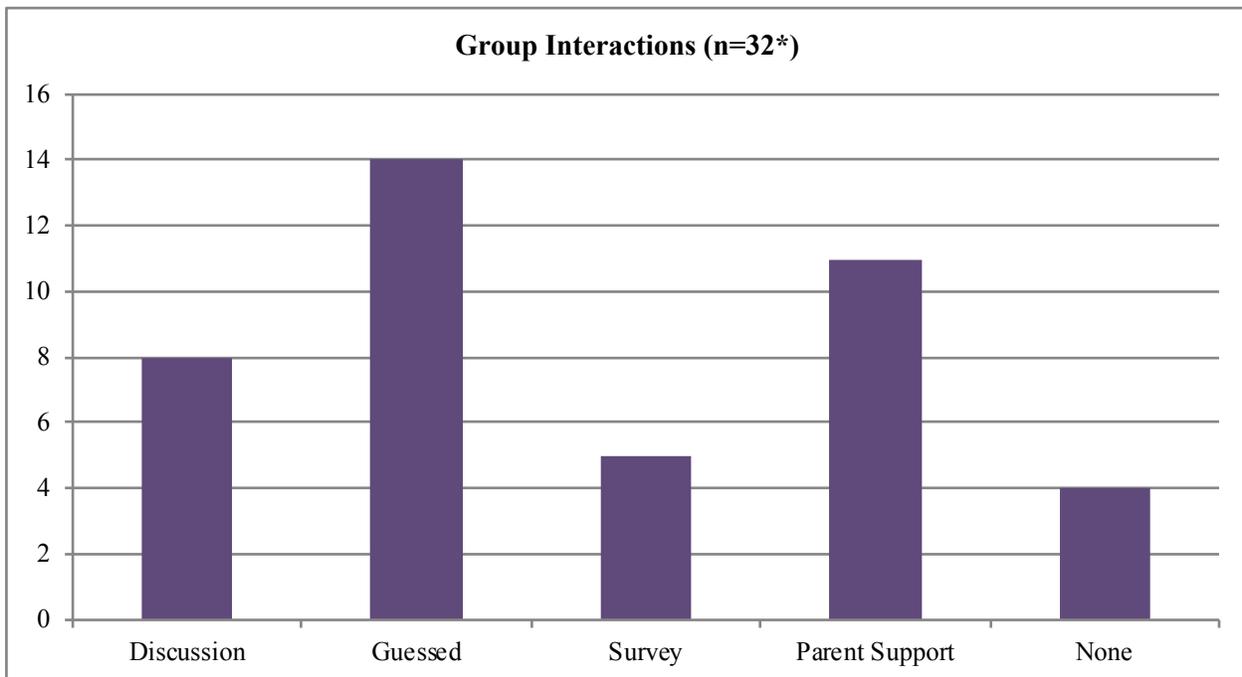


The following terms were used to group and code open-ended responses:

- **Dino Noises** – what noises dinosaurs may have made
- **Vocalization** – how vocalizations are made
- **Estimation** – how scientists figure out what dinosaurs may have sounded like
- **Dinos & Birds** – learning that birds and dinosaurs are related
- **Animal Sounds** – what sounds different animals make
- **Surprise** – scientific answers are not always the same as what we have been lead to believe

Demonstrator Reflection Questionnaire

Group interaction can be hugely beneficial for promoting deeper engagement and learning, and thus the interactions among participants who did the demo in groups were observed. Ultimately, groups interacted at different levels (ordered in the table below from highest to lowest depth of interaction). Most groups guessed the animal/sound pairs together, and their different guesses often lead to interactions and deeper discussion. Parent support was also common, as many parents prompted their children to answer questions, but did not actively play with them or try and figure out the communication strategy. Discussion involved participants reflecting on or recounting what they had learned, and the number of groups who engaged in it is encouraging.



*number of participants who participated in a group of 2 or more

The following terms were used to group and code open-ended responses:

- **Discussion** – discussed what they had learned with one another after completing the activity
- **Guessed** – worked together to figure out which animal belonged with which sound
- **Survey** – participants did not actively participate together, but they did answer questions about the demo together
- **Parent Support** – parents encouraged or prompted children to answer questions, but did not actively participate in the activity or answer questions with them
- **None** – participants did not interact with each other in the activity

Interpretation and Application of Results

The results of this evaluation helped to develop a better understanding of how visitors related to the Prehistoric Voices demo and what they learned from it. Overall, the results largely confirmed the logistical efficacy of the demo. They also present implications for the future operation of the demo, as well as how the lesson may be integrated into other demos.

Both the participant and evaluator questionnaire sought to evaluate whether the demo worked from a practical standpoint, including whether participants understood what they were being asked to do, whether or not it was too difficult, and whether or not they did the activity in the way it was intended. The results indicate that logistically the demo worked well and that participants faced little difficulty completing the activity. They were active in guessing which sounds corresponded to which animal, and often shared ideas in ways that drove intergroup discussion and engagement.

While the activity was successful, there were some logistical issues such as acoustics and distinguishing the sounds that hindered its effectiveness at times. Doing the activity in quieter parts of the hall seemed to be helpful, though in the future it may be better to get a louder speaker or headphones to make the audio more accessible. Another issue that arose was that some of the sounds, such as the ostrich and dinosaur, were too similar. This was likely a result of

the dinosaur sound being created with ostrich or other large bird sounds, so if another audio clip of an accurate dinosaur sound can be found that is more distinct in some way that may be a better choice.

This demo drew an older than average audience. They were better able to engage in discussion about the science underlying the dinosaur vocalization and to understand the distinction between movie sound effects and scientific reconstructions. It would be good in the future, though, to understand what visitors in the young elementary (5-7) range get from the demo, as that is the time when they are first being exposed to those media representations of dinosaur “roars.”

The educational message of the demo on how scientists reconstruct extinct animal vocalizations, specifically in the case of dinosaurs, came across fairly successfully. While the majority of participants focused on the sounds themselves, which was the simplest layer of the activity, a good number of them did take away deeper messages including how scientists reconstruct sounds and the links between birds and dinosaurs that they use to do so.

At the conclusion of this evaluation, the following recommendations leave room for further development and improvement of the demo. Participants were shown a video of the ostrich vocalizing, which many of them found very interesting. Several participants expressed an interest in videos for the other sounds, however none were available. In the future making or locating such visual representations would help to add another layer to the demo and visitors would likely enjoy and benefit from it. As mentioned, addressing any acoustics issues is important and potentially locating a better dinosaur sound may be beneficial.

Prehistoric Voices may be incorporated into an app on dinosaur linguistics, and as part of the app it could serve as the method to explore how dinosaurs communicated vocally. This could be presented in different ways. Vocalization as a communication method could be presented as a branch among other communication methods, with this activity allowing users to see what vocalizations dinosaurs may have made. It could also be part of an activity on how scientists determine how extinct animals communicated. By exploring fossil remains and phylogenetic relationships, users could see how they provide important information in reconstructing sounds. An activity could even be developed that has visitors put together simple clues, such as which modern animals they are most related to, lung capacity, etc., to create an accurate dinosaur noise just as scientists try to do.

References

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Appendix: Questionnaire

The following form was utilized to evaluate visitor's experiences with Dinosaur Communication.

COSI Labs in Life Language Pod Demo Formative Evaluation

Participant Questionnaire

Number of participants in group: _____

Age(s): _____

Gender(s): _____

Relationship to each other: family friends other: _____

1. What was your favorite thing about this demo? What was your least favorite thing?
2. Did you find this demo difficult or confusing? Why do you say that?
3. What do you think we wanted you to learn from this demo?
4. What could we do to make this demo better?
5. Any further comments?

Investigator Reflection/Observation Questionnaire

1. How was the demonstration physically set up? What were the pros and cons of this?
2. What were participant's initial reactions to the demo?
3. Did participants read/listen to the instructions?
4. Did participants read/listen the background information?
5. What steps of the activity did participants do? Which did they not do? What alternative methods did they use?

Activity Step	Completed	Alternative Method
Listen to recordings	Y/N	
Make guesses with flashcards	Y/N	

6. Were participants able to complete the activity? If not, why?

7. If applicable, what kind of assistance did you need to provide to participants so that they could complete the activity?
8. Did participants interact with each other?
9. Did participants discuss what they were doing/had done in the activity with one another? What did they discuss?