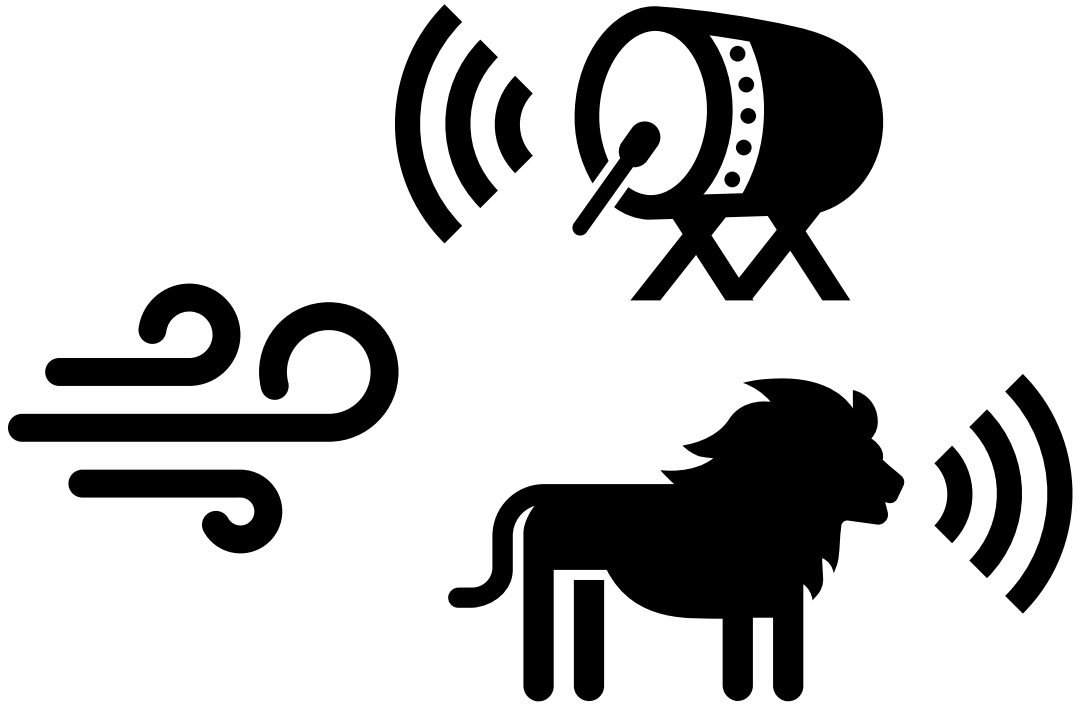
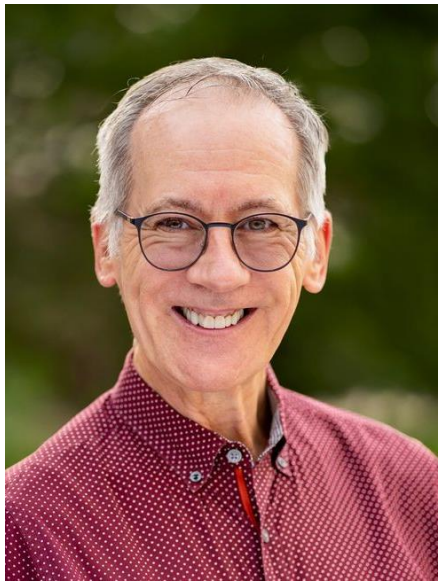
Bang, whoosh, roooaarrrr!
Ways sound affects learners at zoos and aquariums

September 30, 2026

AZA 2026 Annual Conference



Meet the Panel



Joe E. Heimlich, Ph.D.
Moderator



Grayson Ponti, M.A.
Panelist

ZANE
Zoos and Aquariums for a Neurodiverse Ecosystem



Kelly Riedinger, Ph.D.
Panelist

Oregon State University
STEM Research Center



Laura Weiss, M.A.
Panelist

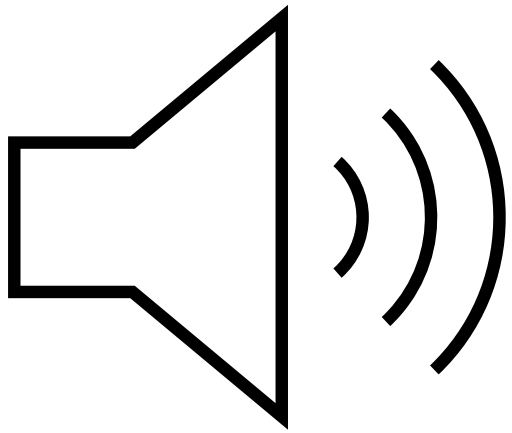
cosi Center of Science and Industry
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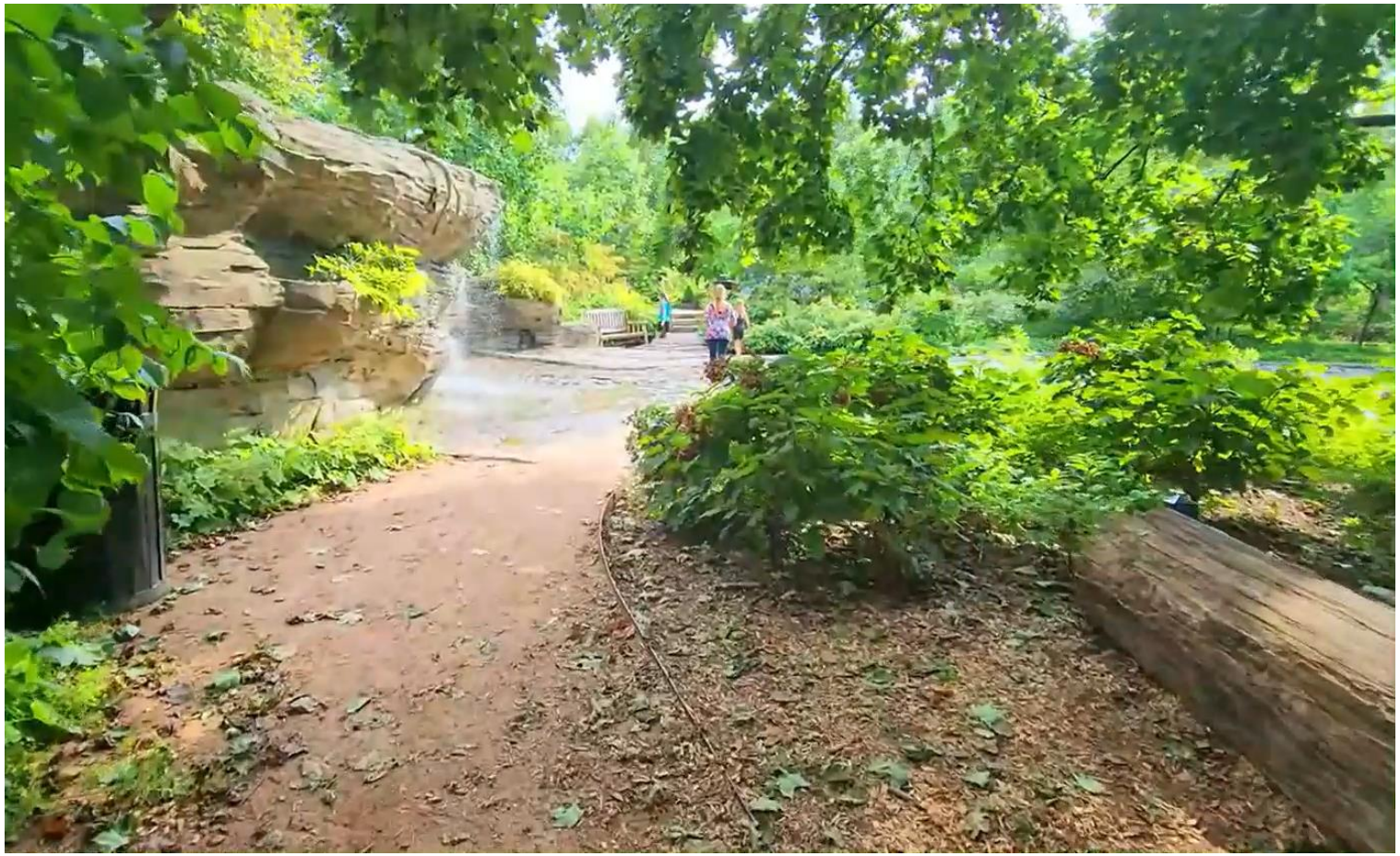
Danielle Ross, M.S.
Panelist

COLUMBUS ZOO AND AQUARIUM

Listening Activity



Listening Activity



Fantabulous Travels (2022, November 13). Franklin Park Conservatory and Botanical Gardens Columbus Ohio Tour [Video]. YouTube. https://www.youtube.com/watch?v=Otash_ClvO8&t=2430s.


ANDEAN BEAR
Tremarctos ornatus
Andean bears are the only bear species now found in South America. Although they are reclusive, Andean bears have a long history with their human neighbors.
There is evidence that ancient cultures honored and revered Andean bears. There are many depictions of bear-like creatures in ancient art.
HONORING ANCIENT ANDEAN BEARS
Living with Bears

Learning Objectives

1) Session participants will be encouraged to think about sound in zoos and aquariums more intentionally and consider applications for research findings to create positive and accessible visitor and learning experiences

2) Session participants will consider ways different audiences and individuals deal with and experience sound

3) Session participants will be exposed to ways practitioners in zoos and aquariums can create experiences around sound

Session Agenda

1) Presentations (30 minutes)
    - *Designing with Sound for a Broad Audience* – Grayson & Kelly
    - *Sound Travels Spotlight: Columbus Zoo & Aquarium* – Laura
    - *Right Sound, Right Place* – Danielle
2) Small Group Discussions & Activity (30 minutes)
3) Panel Discussion and Q&A (20 minutes)

Designing with Sound for a Broad Audience

- Visitors experience sound differently & there is no “average” listener
- Some visitors may actively seek out and enjoy sound-rich experiences
- Other visitors may prefer to avoid certain sounds or minimize auditory stimulation
- Exhibit soundscapes that offer choices and flexibility work for everyone

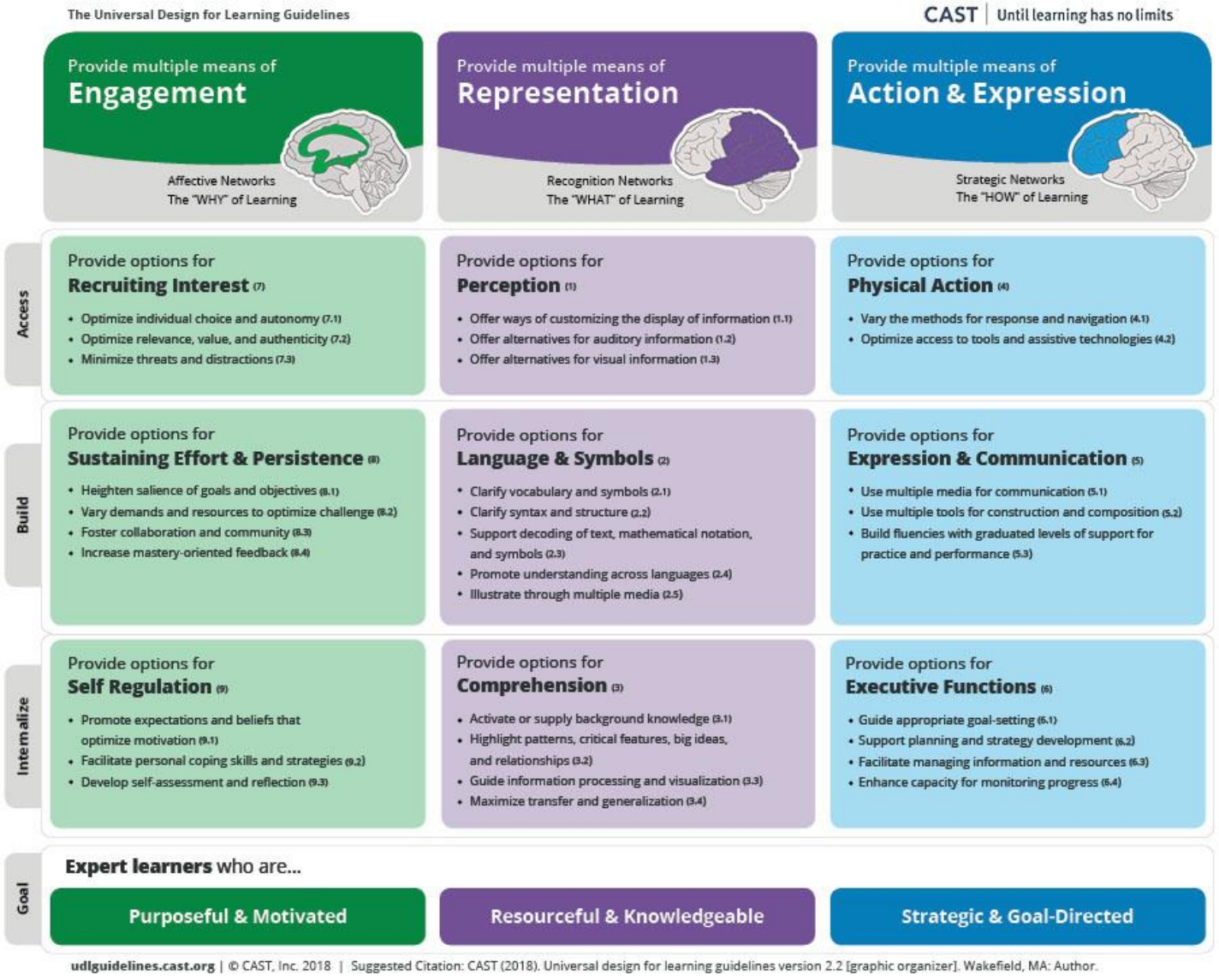
Universal Design

- Design for variability at the start
- Build in flexibility, choice
- Provide multiple ways of engaging



Universal Design for Learning

- Multiple means of engagement
- Multiple means of representation
- Multiple means of action and expression



Universally Designing for Sound in Exhibits

Principle	Exhibit Design
Predictability	Visitors know where to expect loud sounds and where they can find quiet spaces
Options	Exhibit space is designed with immersive sound areas, reduced sound areas and quiet areas
Meaningful sounds	The sounds serve a purpose rather than simply adding stimulation and sounds aren't all competing with each other
Multiple modes of engaging	Information conveyed through sound is also available visually and/or tactilely and choosing the quiet option does not mean missing any education content

Sensory Supports

- Sensory or soundscape map
- Labels or icons that indicate different sound areas
- Signage for unpredictable sounds
- Pre-visit information
- Volume controls
- Design for accessibility first with noise-reducing headphones as one of several options that help visitors customize their experience



Designing ***WITH*** not **FOR**



COSI Center of Science and Industry | CENTER FOR RESEARCH & EVALUATION

Sound Travels Spotlight: Columbus Zoo & Aquarium

Laura Weiss

Researcher
COSI's Center for Research and Evaluation

lweiss@cosi.org



Sound Travels is an **NSF-funded** (AISL #2215101) project researching **how soundscapes affect visitors in informal STEM learning settings** and how practitioners can use this information to support visitors more effectively.

Project Leadership:

TERC

Northwestern University

CENTER FOR RESEARCH & EVALUATION

Research Partner Sites:

Franklin Park Conservatory and Botanical Gardens

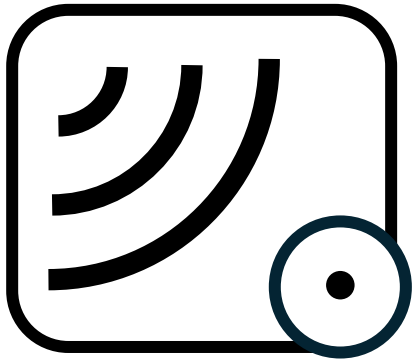
COLUMBUS ZOO AND AQUARIUM

Metro Parks

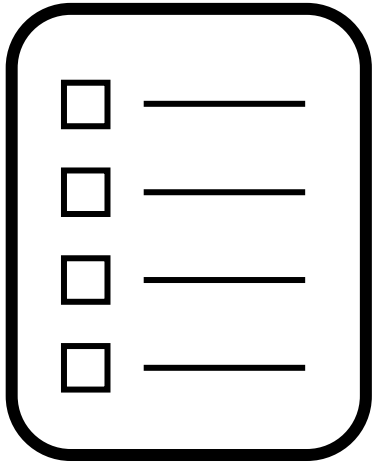
COSI Center of Science and Industry

We used three data collection methods for this study.

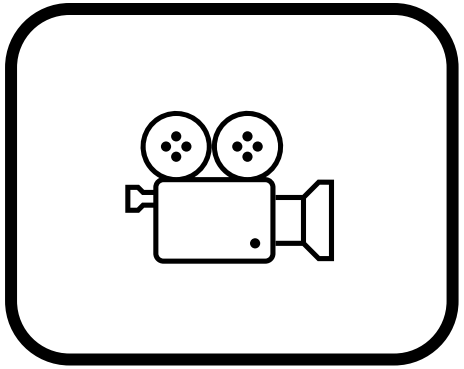
Audio moths to record ambient sounds.



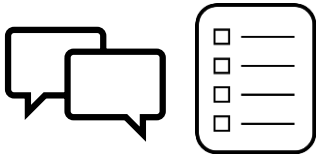
An **exit questionnaire** about visitors' backgrounds and experiences with sound in a zone.



A **Sound Search** activity where visitors used a tablet to record sounds as they explored a zone.



+ a brief **interview** and the **questionnaire**



At the Columbus Zoo, we collected…

366 questionnaires

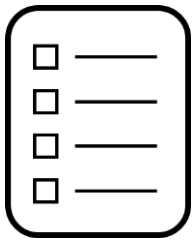
47 Sound Searches
(175 videos)

Dates:
June 14-26 &
July 5-7 , 2025

In two zones:
Reptile Building
& **Heart of Africa**



About Respondents



366 questionnaires

- **52%** visiting **with kids** under 18
- **24%** were **first-time** visitors
- **25%** were **members**
- **55%** identified as **female**
- **74%** identified as **white**
- **51%** held a **college degree**

On the questionnaire, we asked visitors to rate their expectations for and experiences of types of sound they might hear at the Zoo.

Prompts:

***Prior to visiting today**, I expected to hear sound during my visit to the Columbus Zoo that would…*

***During my visit today**, I heard sounds in the [Heart of Africa/Reptile Building] that…*

Scale: 1-Strongly Disagree to 5-Strongly Agree

Rating Items:

- Make me feel peaceful
- Be uncomfortable to my ears
- Help me reflect on the things I was learning
- Make it hard for me to focus
- Make me feel energized
- Make me feel uneasy
- Make it difficult for me to communicate with other people

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⟶ Responses split into two groups; one representing **positively coded feelings**

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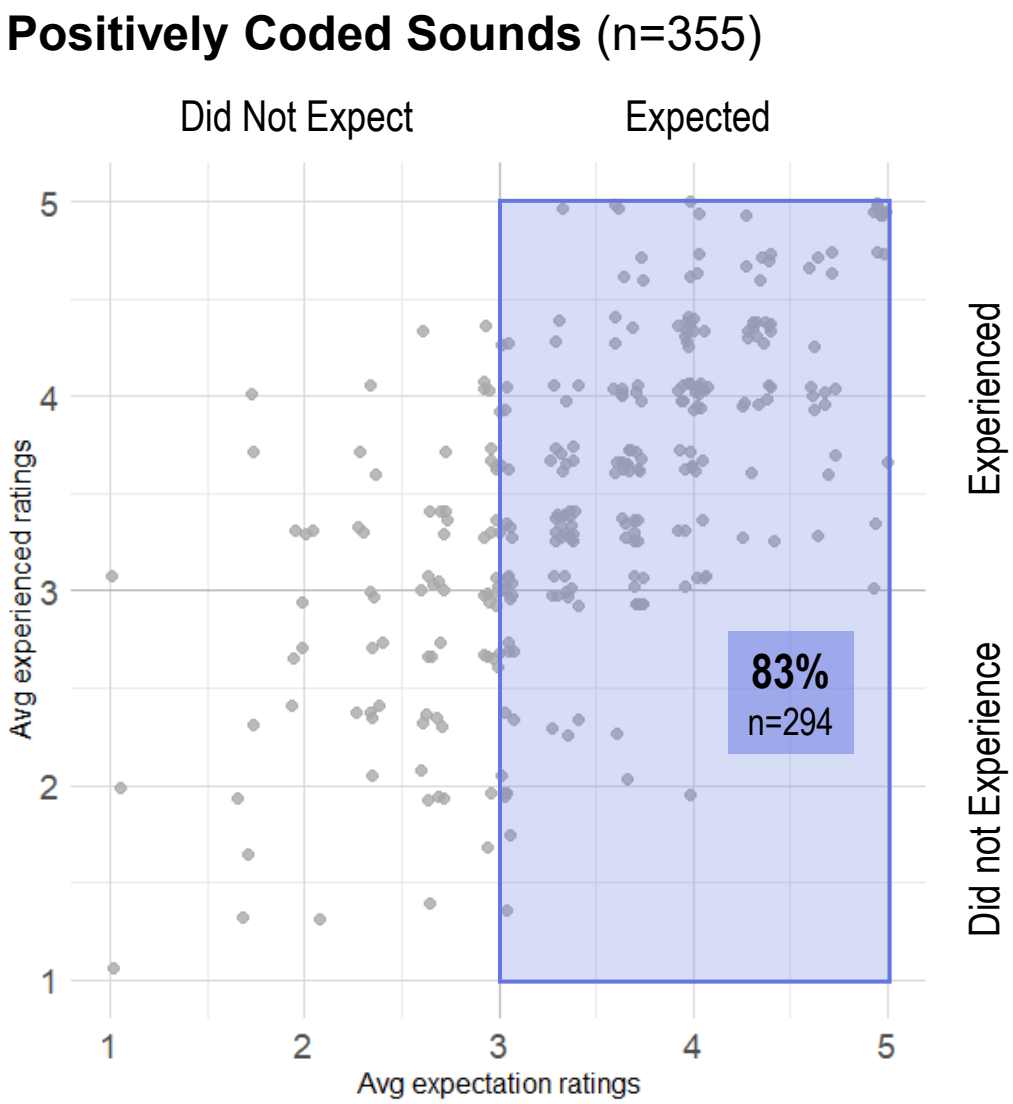
Scale: 1-Strongly Disagree to 5-Strongly Agree

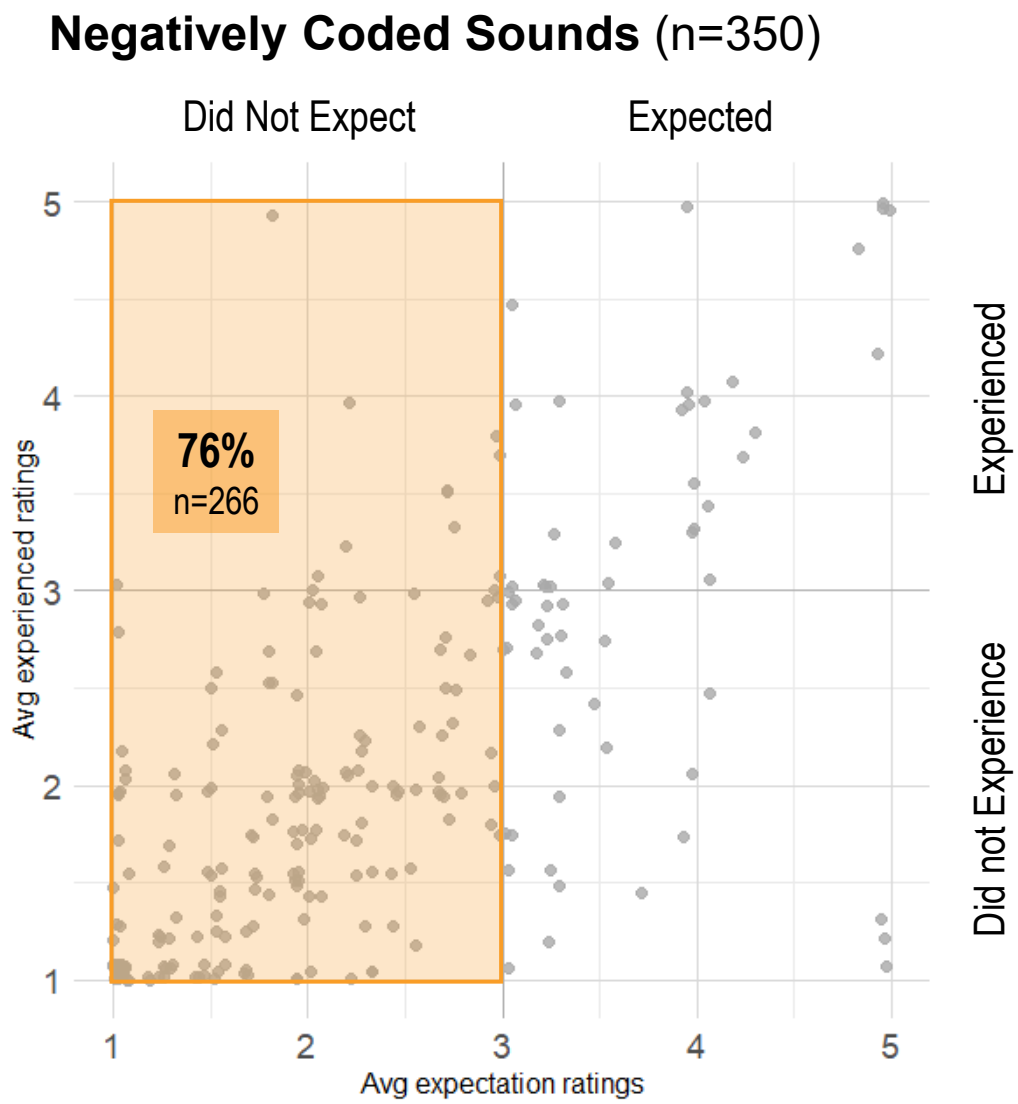
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- Make me feel energized
- **Make me feel uneasy**
- **Make it difficult for me to communicate with other people**

⟶ Responses split into two groups; and one representing **negatively coded feelings**

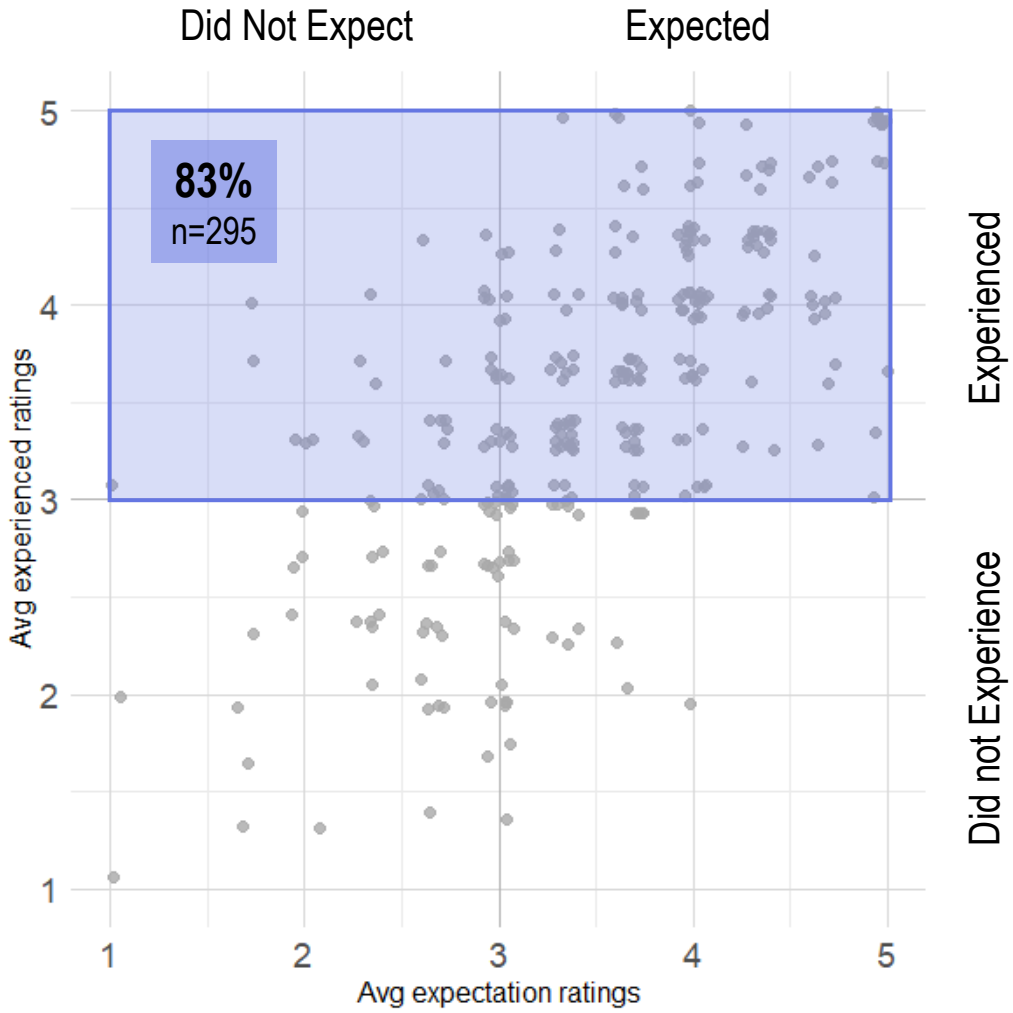
Most Zoo visitors **expected** **positive sounds** and **did not expect** **negative sounds**



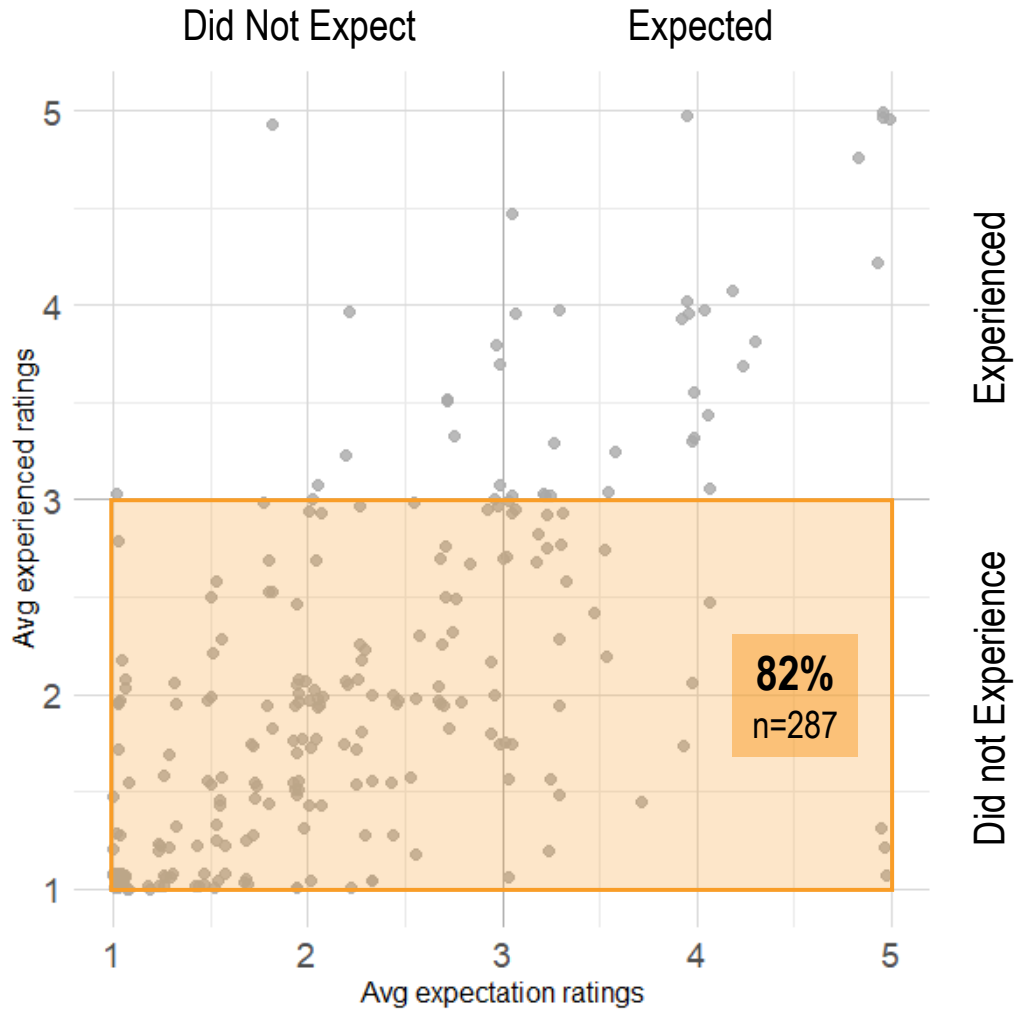


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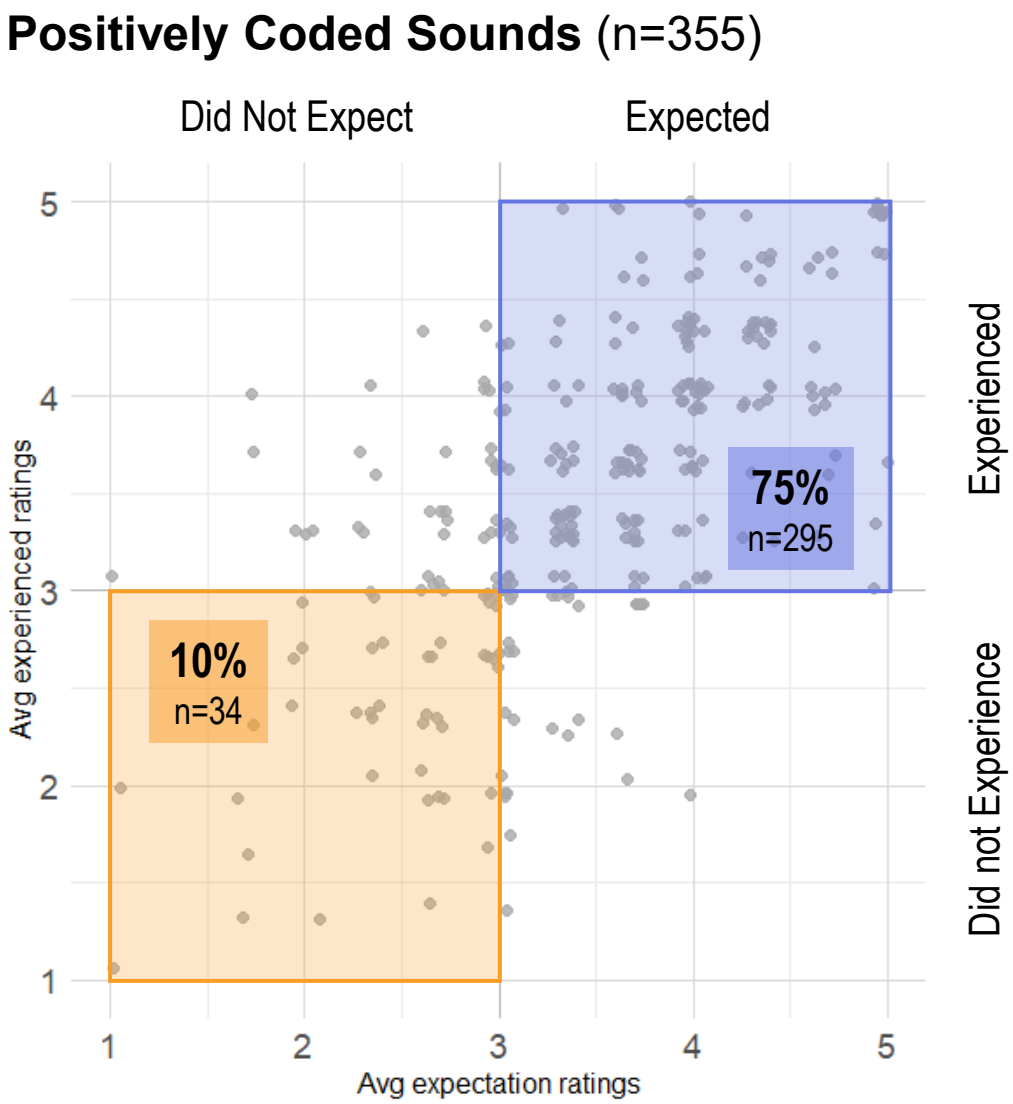
Positively Coded Sounds (n=355)

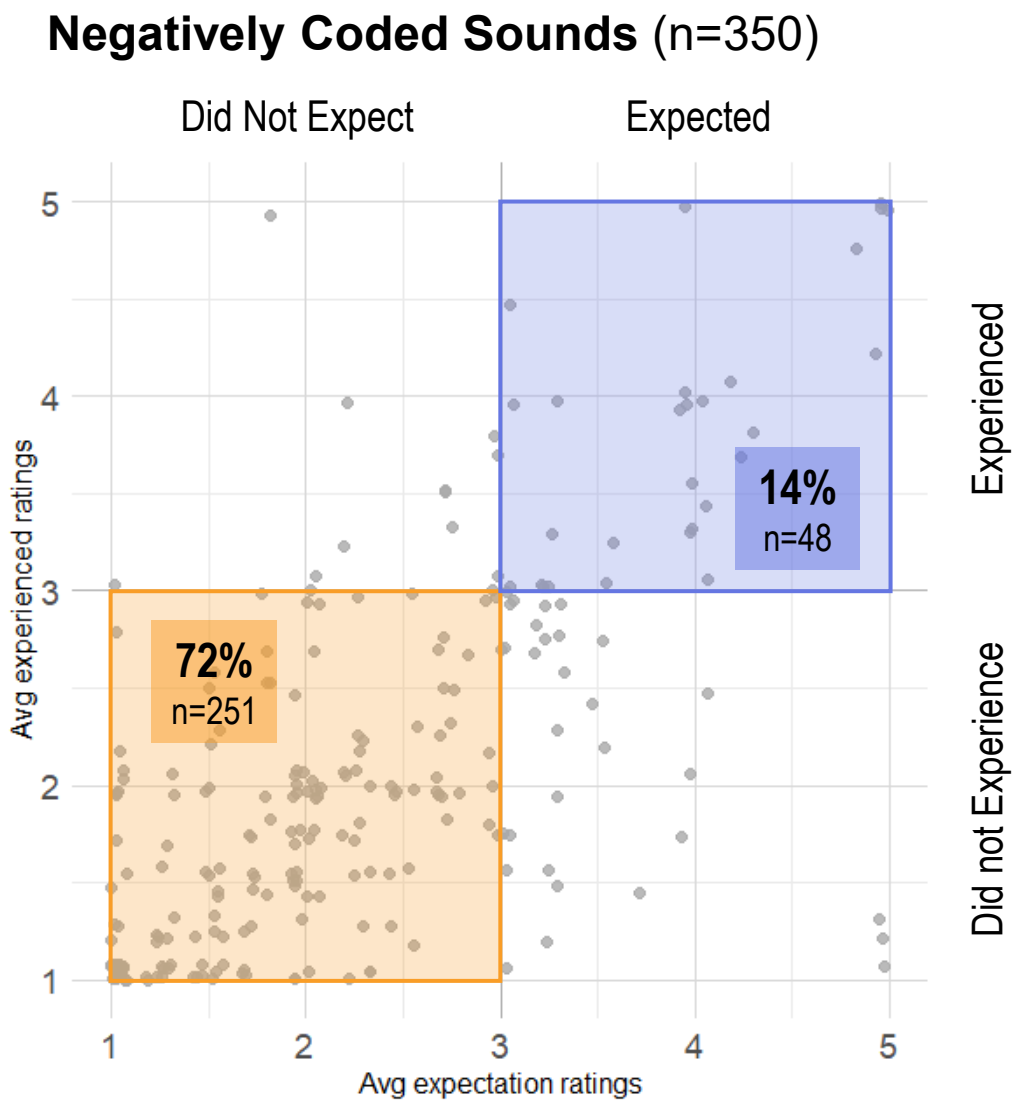


Negatively Coded Sounds (n=350)



Zoo visitors often **had about the sound experience they expected**





On the questionnaire, we asked visitors to rate statements associated with their learning engagement, which combine into a single factor.[1]

Prompt: *Thinking about your visit to [Heart of Africa/the Reptile building], how much do you agree with the following statements?*

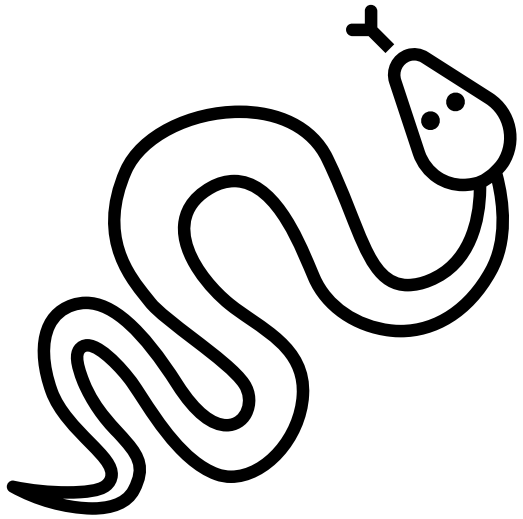
Scale: 1-Strongly Disagree to 5-Strongly Agree

Rating Items:

- I like this exhibition
- After seeing this exhibition, I think I will enjoy the topic more
- This exhibition helped me understand the world around me
- When I engaged with this experience, I was able to explore ideas that were interesting to me
- The experience was fun
- I learned something new
- The experience was boring
- I will recommend this to a friend or family member
- This experience kept me interested

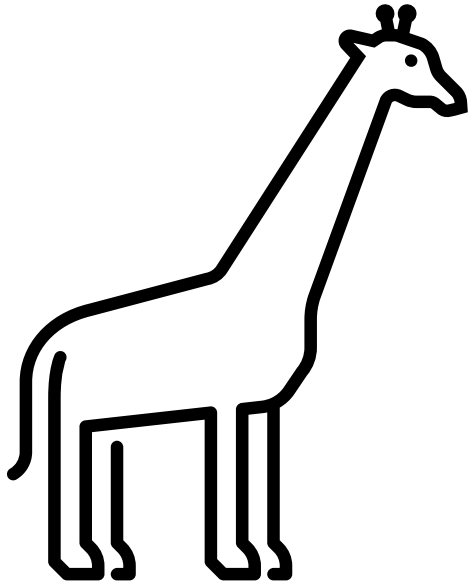
[1] Weiss, L., & Hayde, D. (2022, July 12-14). *Unpacking the CRaTE: Measuring Visitors' Cultural Relationships and Topical Exploration*. [Live conference presentation]. Visitor Studies Association annual conference, Omaha, NE.

The average summated learning engagement ratings for the Zoo suggest a **strong indication of learning** in each of the zones.



Reptile Building

4.32

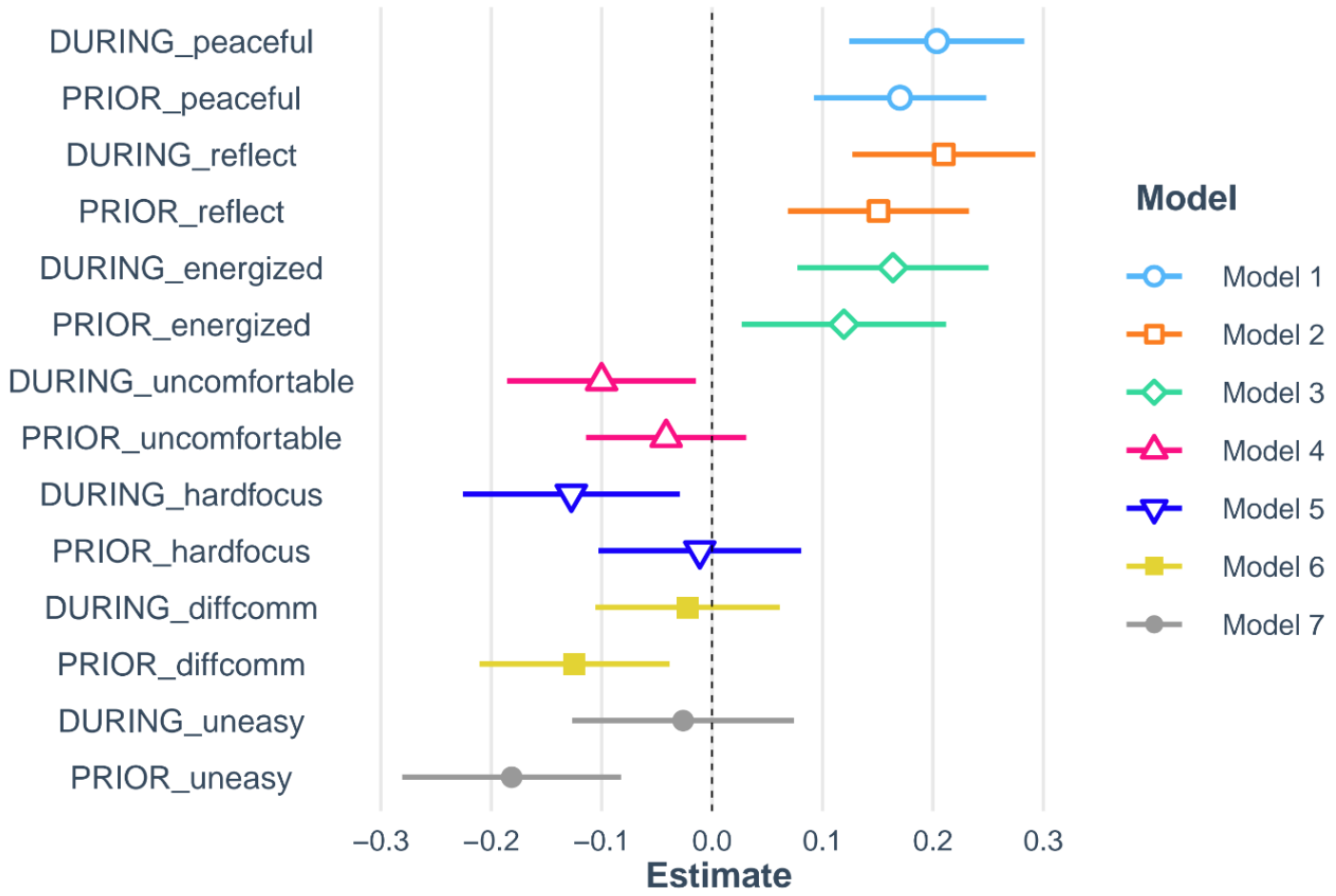


Heart of Africa

4.19

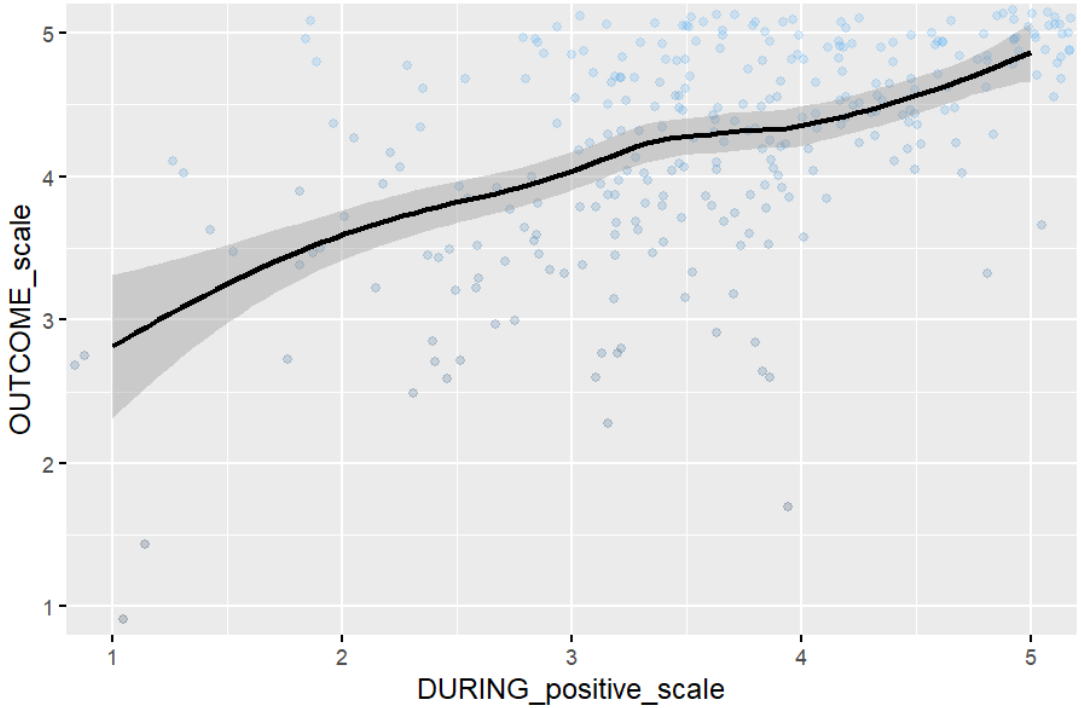
Across all research sites, the **reported sound experience** had a **greater estimated effect** than the expected sound experience on the learning outcome indicators.

However, **in the Zoo data**, **the differences** in estimated effect were **much smaller** (and nonsignificant).

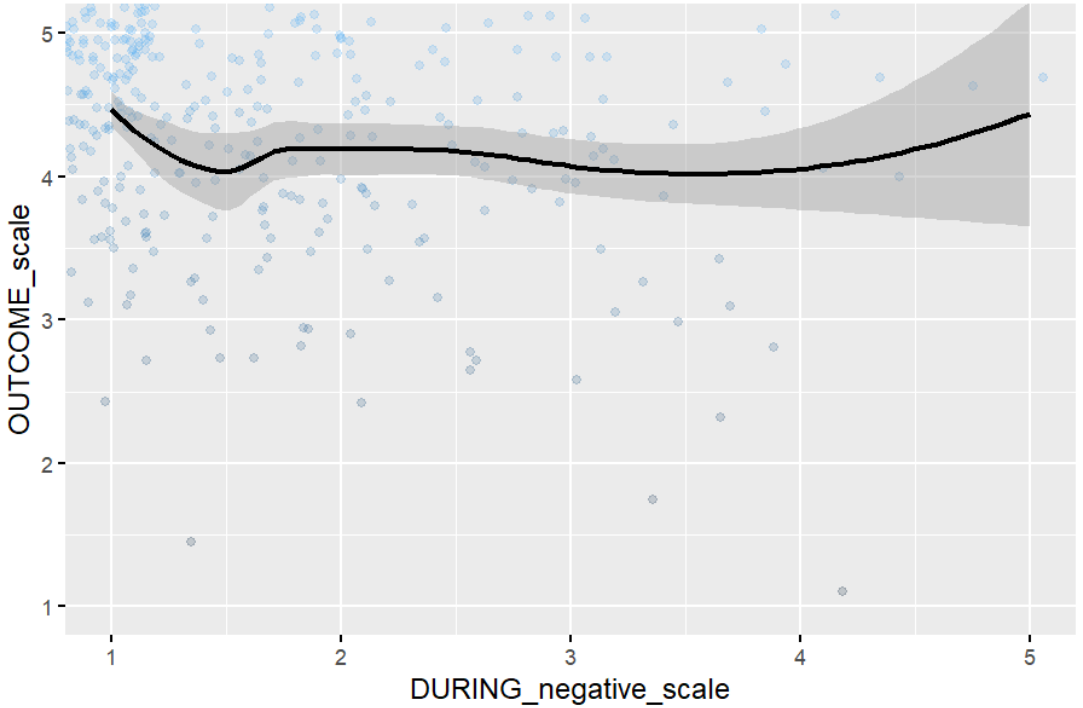


Compared to positive sound experiences, negative sound experiences **do not** seem to have a strong effect on learning outcomes.

Learning Engagement by Experienced **Positive** Sounds



Learning Engagement by Experienced **Negative** Sounds



This table shows the most frequent confirmed sound sources we observed in Sound Search videos for each adjective within each zone.



	Peaceful	Curious	Energized	Uneasy
Reptile Building	Reptiles Birds Rain	Reptiles Birds	Reptiles Human voice Rain	Reptiles Human voice Human footsteps
Heart of Africa	Birds Musical instruments Music performance	Human voice Musical instruments *Various*	Musical instruments Vehicles Wood	Human voice Insects Vehicles

Visitors used many of the **same sounds to represent different emotional states**, affirming that individual sounds hold a range of meanings to people.

	 **Peaceful**	 **Curious**	 **Energized**	 **Uneasy**
Reptile Building	Reptiles Birds Rain	Reptiles Birds	Reptiles Human voice Rain	Reptiles Human voice Human footsteps
Heart of Africa	Birds Musical instruments Music performance	Human voice Musical instruments *Various*	Musical instruments Vehicles Wood	Human voice Insects Vehicles

In the Reptile Building, interpretation that included **recorded sound** was particularly prominent in visitors' videos.



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Reptile Building	Reptiles Birds Rain	Reptiles Birds	Reptiles Human voice Rain	Reptiles Human voice Human footsteps
Heart of Africa	Birds Musical instruments Music performance	Human voice Musical instruments *Various*	Musical instruments Vehicles Wood	Human voice Insects Vehicles

Aldabra Tortoise Button (Reptiles)
Alemeida, C. & Hirstov, N. (2023). *Directional Mic_Iconic_Reptile House Tortoise Button* [Recording]. On *Sound Travels: Columbus Zoo & Aquarium*. Solidarity Studios.

Recorded sound is also prominent in Heart of Africa, but **musical instruments** that encourage playful sound experimentation were strongly represented too.



	Peaceful	Curious	Energized	Uneasy
Reptile Building	Reptiles Birds Rain	Reptiles Birds	Reptiles Human voice Rain	Reptiles Human voice Human footsteps
Heart of Africa	Birds Musical instruments Music performance	Human voice Musical instruments *Various*	Musical instruments Vehicles Wood	Human voice Insects Vehicles

Drums (Musical instruments)
Alemeida, C. & Hirstov, N. (2023). *Directional Mic_Iconic_Heart of Africa's Drums* [Recording]. On *Sound Travels: Columbus Zoo & Aquarium*. Solidarity Studios.

Airplane Interactive (Vehicles)
Alemeida, C. & Hirstov, N. (2023). *Directional Mic_Iconic_Heart of Africa's Airplane* [Recording]. On *Sound Travels: Columbus Zoo & Aquarium*. Solidarity Studios.

The **environmental differences** (indoors vs. outdoors) seemed to influence visitors' perceptions of crowd levels and **sounds associated with humans**.



	Peaceful	Curious	Energized	Uneasy
Reptile Building	Reptiles Birds Rain	Reptiles Birds	Reptiles Human voice Rain	Reptiles Human voice Human footsteps
Heart of Africa	Birds Musical instruments Music performance	Human voice Musical instruments *Various*	Musical instruments Vehicles Wood	Human voice Insects Vehicles

Right Sound, Right Place

Empowering People.
Saving Wildlife.

COLUMBUS ZOO AND AQUARIUM



Shifting Our Thinking

Empowering People.
Saving Wildlife.

COLUMBUS ZOO AND AQUARIUM

We consider sound early in the design process rather than adding it later.

Rather than asking "Do we need sound," we ask "How should the presence or absence of sound support the visitor experience?"



Being Intentional in Physical Spaces

Empowering People. Saving Wildlife.

COLUMBUS ZOO AND AQUARIUM

The John F. Wolfe Aquarium -

- Where sound should be present and where it should not?
- How do visitor flow and acoustics overlap?
- How do we balance engagement with comfort and accessibility.
- What are the different sound needs for different spaces?



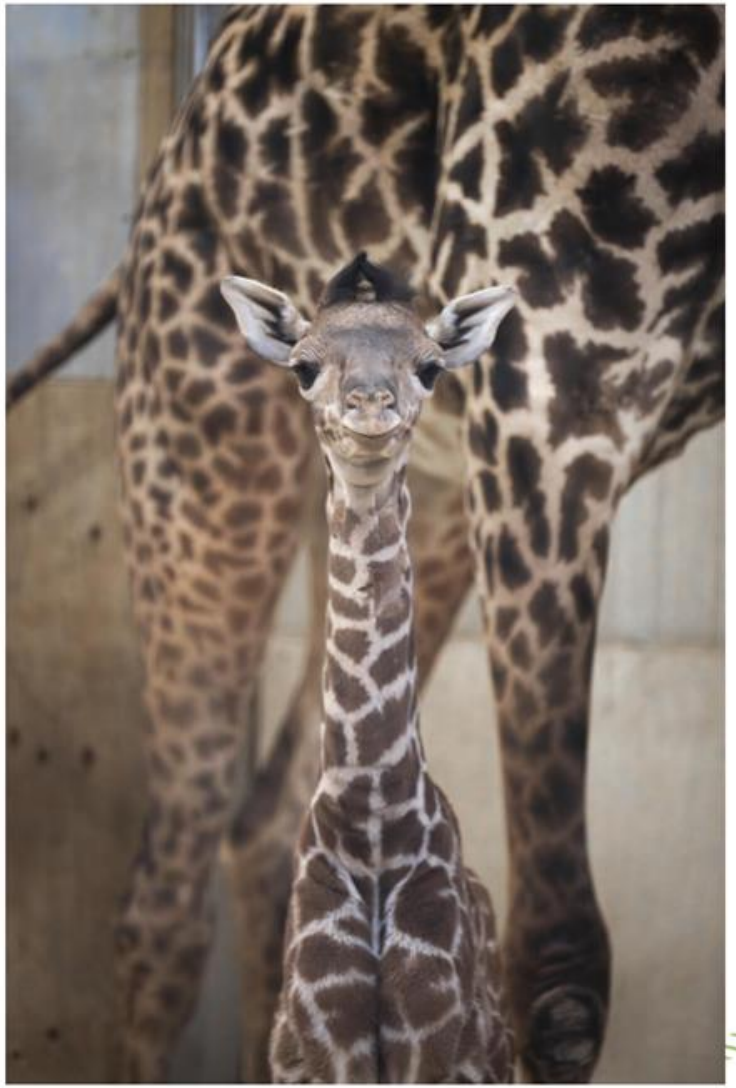
Sound in Virtual Reality

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Saving Wildlife.
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In VR, sound isn't supporting the experience. It is helping create the experience.
Do we create experiences with or without narration?
Ambient noise vs. Produced sound?



What We Are Learning



Sound should be considered from the beginning.

Less can be more. Intentional sound often works better than constant sound.

Sound should support visitor goals, not compete with them.

Thank You

Empowering People.
Saving Wildlife.

COLUMBUS ZOO AND AQUARIUM

Danielle Ross
VP, Conservation Education and Engagement
Danielle.Ross@columbuszoo.org



Session Agenda

Small Group Discussions & Activity

- Individual brainstorming
- Small groups
- Share-out form

Panel Discussion and Q&A

- Submit a question
- Review share-out dashboard

Individual brainstorming (3 minutes)

1) Choose a program or exhibit

2) Think about its goals & audience

3) Jot down what sounds – intended & unintended – are present during the experience. Consider:

- **Recorded/programmed sounds** (e.g., interactives, videos)
- **Planned soundscape** (e.g., music, immersive audio)
- **Human sounds** (e.g., voices, footsteps)
- **Animal sounds** (e.g., birdsong, barking)
- **Ambient nature sounds** (e.g., trickling water, wind)
- **Ambient operational sounds** (e.g., HVAC, tank pumps)
- **Interruptive external sounds** (e.g., traffic, alarms)

Small groups (15 minutes)

1) Form groups of ~3 with people seated near you
2) Pick a sound from your program/exhibit and discuss with your group how you currently or might approach it.
    - **Ignore** – The educator or exhibit designer do not notice or do not address the sound.
    - **Acknowledge** – The educator points out the sound and simply proceeds. The designer makes a brief reference to the sound in the exhibit interpretation.
    - **Incorporate** – The educator is able to adapt their standard program facilitation to include the sound. The designer creates exhibit elements that can be adjusted depending on the sounds present.
    - **Remove** – When possible, temporarily or permanently removing the cause of the sound. This can also include opportunities for visitors or program participants to “remove” themselves and relocate away from the sound.
    - **Design** – Intentionally developing programs or exhibits where the sound is an integral part of the experience. The sound drives planning (rather than plans being adjusted in real time to incorporate the sounds).