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Is this made for me?

Learning about exhibit design from
youth with learning disabilities

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WARNER
SCHOOL OF EDUCATION
UNIVERSITY of ROCHESTER



MUSEUM &
SCIENCE CENTER



Museum of Science



EdTogether

Project Background + Methods

Who are we

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Advisory Board

- **Adam Hickey** - Landmark School
- **Bob Cunningham** - Understood.org
- **Amy Hurst** - New York University
- **Janice Majewski** - Institute for Human Centered Design

Project Background

- The informal science learning (ISL) field has committed considerable energy and resources to **improving accessibility of facilities and experiences** (Tokar, 2004), but with a with a **focus on physical and sensory aspects** (e.g., Access Smithsonian, 2019)
- Little is known about the ISL experiences of the largest group of people with disabilities in the United States: visitors identified as having **learning disabilities (LD)**
 - Individuals with learning disabilities comprise up to 20% of the U.S. population
- Best practices for students with LD in science classes (e.g., Therrien et al., 2011) may not translate well to ISL
- Informal science learning experiences can be particularly powerful for young people with LD, who often thrive in active science learning opportunities (Abrams, Southerland, & Silva, 2007; Nadelson et al., 2013)

Research Questions

- How do visitors with LD **describe their experiences** of in a variety of exhibits?
 - We focus particularly on motivation and engagement.
- What **aspects of design** are most salient in experiences among visitors with LD?

Rochester Museum & Science Center

A hybrid hands-on science center and collections-rich cultural museum

Has more than 1.2 million collection items

Serves more than 378,000 visitors each year

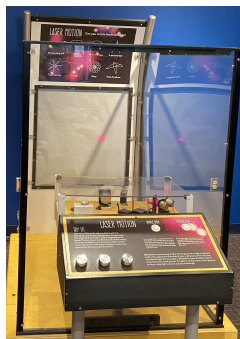
Chemical Fingerprints



Laser Communicator



Laser Motion

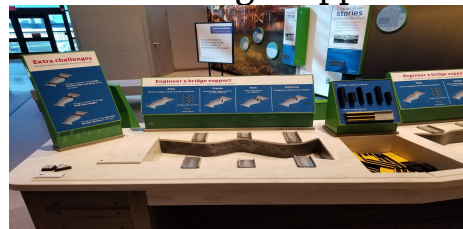


Museum of Science, Boston

River Table



Build a Bridge Support



Mystery Skulls



One of the world's largest science and technology centers.

700+ interactive exhibits across more than 110,000 sq ft of public exhibition space.

Hosts 1.4 million visitors annually on site.

Project Design

Co-design charrette with youth with LD and ISL practitioners to jointly generate guidance for field

Analyze and
compile findings

04

Contribute to the informal science learning field!

Pilot testing with youth with LD to test survey and get initial idea of experiences using **virtual exhibits**

Inform research
design

01

Learning
from and
with Youth

03

Work with
exhibit designers
to prototype
changes

02

Mixed methods experimental studies (Phase 2) with 80 participants (40 at each museum) to test prototypes of design strategies

Descriptive study (Phase 1) with 31 participants (19 at MOS and 12 at RMSC) to understand visitors' experiences using an array of existing exhibits

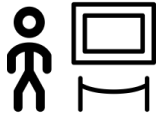
Learning from Youth with LD - Study Design

Descriptive Study (Phase 1)

~30 participants (ages 10-17)



Survey:
Initial
impressions



Interact with
exhibit

Experimental Study (Phase 2)

~50 participants (ages 10-17)



- Survey: Post-impressions
- Interview: Experience
- Card sort: Preferences

At each
of two
exhibits

- With random assignment to original or prototyped version
- Adding an identity activity

What changes did we test?

Phase 1 changes: MOS

Mystery Skulls

Identify what each skull belongs to by answering questions about its observable features

- Vocabulary was sometimes difficult for participants, and negatively impacted the level of challenge

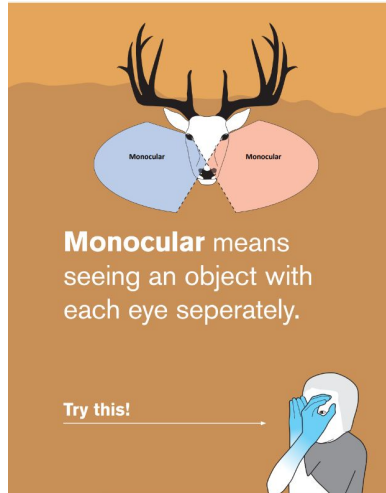
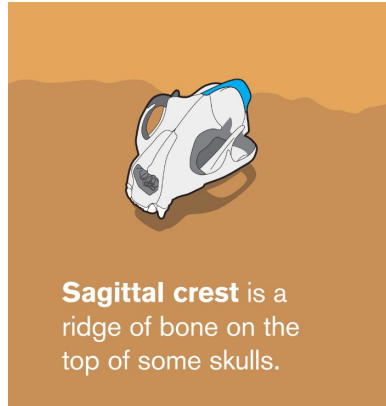


Phase 1 changes: MOS

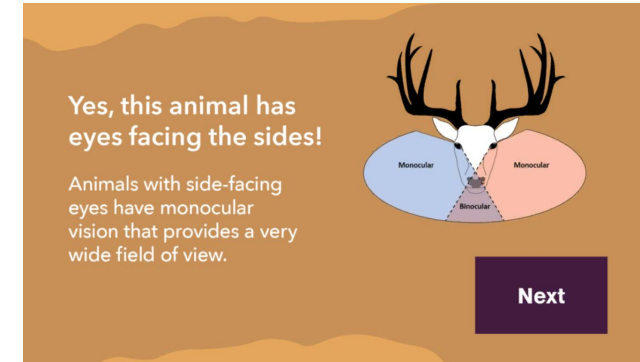
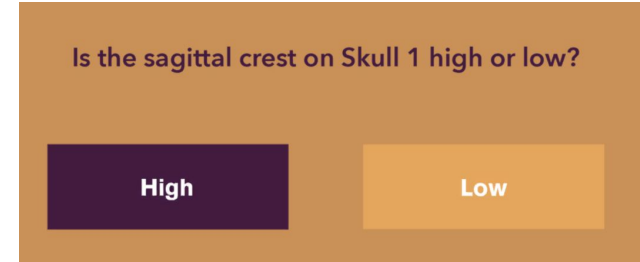
Mystery Skulls

- Vocab cards were added to help users understand words used by scientists who study skulls
- The cards include simplified definitions, images, and actions to mimic the animal's features

Vocab Cards



On screen info



Phase 1 changes: MOS

Build-a-Bridge

Engineer a structure that can support a bridge in moving water

- Exhibit instructions were image-based and easy to understand
- Youth wanted to have more hands-on creative elements, and challenge



Phase 1 changes: MOS

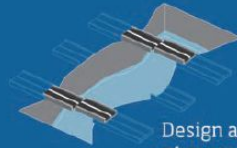
Build-a-Bridge

- Updated the text and illustrations for clarity, and added animal figures to incorporate more storytelling into the activity.

Original challenges

Extra challenges

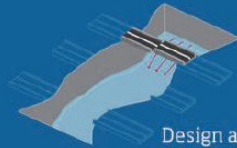
Use the materials to complete the extra challenges.



Design a support that **works at more than one place** along the river.



Design a support that **can hold extra weight**.



Design a support that **does not disrupt the flow** of the river.

New challenges

Extra challenges



Mobile bridge

Build a bridge that can be moved so the coyote and deer can cross in different locations.



Heavy load

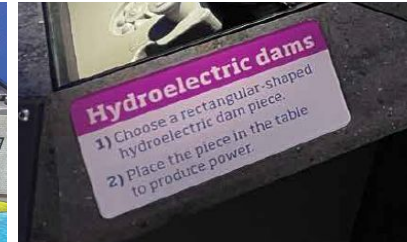
Build a bridge that can hold the weight of a herd of deer.

Phase 1 changes: MOS

Engineering a River System

Explore the trade-offs of how different engineering decisions can impact a river system

- Participants thought they were “getting it wrong”
- Instruction labels were long
- Audio button label said “read text aloud” which was potentially stigmatizing

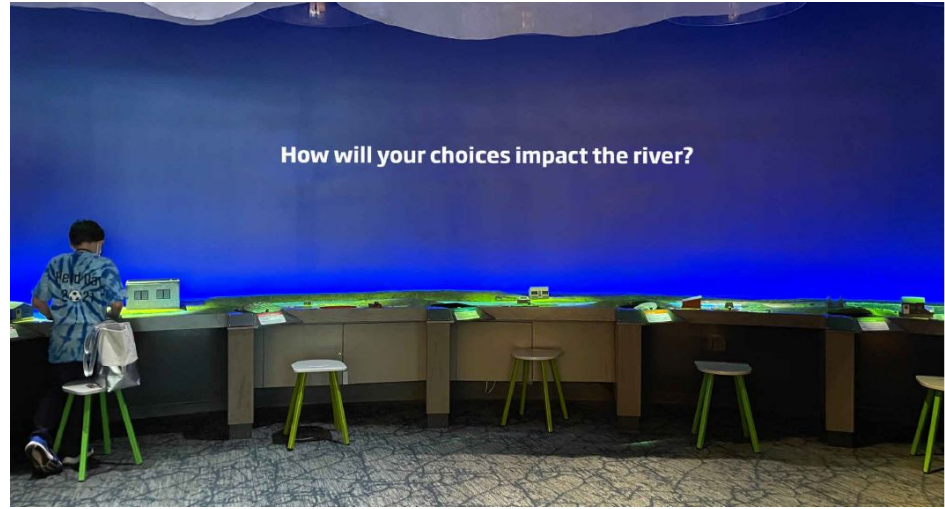


Phase 1 changes: MOS

Engineering a River System

Explore how different engineering decisions impact a river system

- Adding a subtitle to clarify the exploratory nature of the exhibit
- Simplifying instructional text
- Changing “hear audio aloud” to “Audio on/off” (in line with the rest of the MOS)



How do different types of **hydroelectric dams** impact the river?

- 1) Choose a rectangular piece.
- 2) Place the piece to produce power.



Exhibits: RMSC

LASER COMMUNICATOR

Sound transmitted through fiber optics or air to a receiver.

- Too many options
- Wordy label copy
- Significance not clear



Exhibits: RMSC

LASER MOTION

Adjust reflecting laser to create moving patterns.

- Too many options
- Unclear navigation
- Intended experience not clear



Exhibits: RMSC

CHEMICAL FINGERPRINTS

View emission spectra from energized gases

- Difficult to match patterns to gas
- Wordy label copy
- Significance not clear



What have we learned?

What have we learned and ongoing conundrums?

- **Finding 1:** Exhibit text created various challenges
- **Finding 2:** Audio was seen as beneficial
- **Finding 3:** Desire for creativity and open-ended exploration
- **Finding 4:** Awareness of how challenge shaped engagement

The Charette and Conundrums

Charette Plans

- Purpose of the charette is for youth with LD and exhibit practitioners to work together to generate a guide for the field based on the project research
- Youth will also work with research team members to create portraits of diverse youth with LD to live alongside, and inform the guide in a holistic way.
- Findings and ongoing analysis from Phase 1 and Phase 2 has uncovered a series of exhibit design “conundrums” which are areas with limited information, or conflicting interpretations.
- We plan to use the charette dive deep with youth and clarify these conundrums for the museum practitioner community.
- ***Help us, help you! Let’s dive into the conundrums and clarify how they are framed for the charette.***

Conundrum 1: Hands-on

"I think they [manipulables in the exhibit] are good for motivation. They give, like, that type of vibe, type of, like, feeling that you gotta keep doing this and you gotta... It's, like, almost like a competition that way."



Conundrum 1: Hands-on

- Youth were clear that they want exhibits that are hands-on. But, when designers create hands-on exhibits there are many ways to do it. And, what hands-on means to youth with LD may be different from youth without LD.
1. What does the term “hands-on” mean to you as an exhibit practitioner?
 2. What would you want to know from youth with LD to make guidance about “hands-on” actionable for you?

Conundrum 2: Information

"[Having instructional images] It's much better than having, let's say, like, just the words. And for me, dyslexic, that won't just, that won't help that much."



Conundrum 2: Information

- In general, youth with LD preferred to get information from videos or graphics. Redundancy (text-graphics-audio-video) seemed important.
- Youth tended to indicate text avoidance, and some were concerned about using audio for read aloud because of social stigma.

1. How are you thinking about the use of audio and text in exhibits at your museum?
2. What would you want to know from youth with LD about how different supports work (or don't work) for them?

Conundrum 3: Creativity

"I felt, you know, very satisfied, you know, building and constructing, looking at a different ways testing and trial and error processes. Very creative."



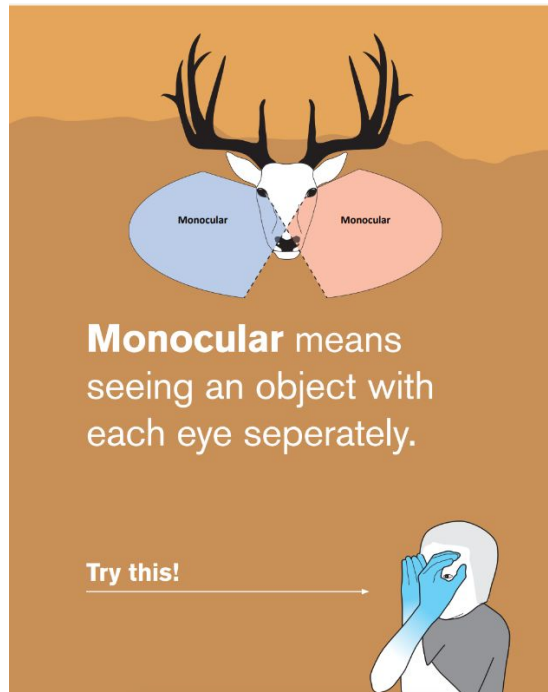
Conundrum 3: Creativity

- Youth with LD were clear and consistent that they prefer and learn best from exhibits where they can be creative. But, there are many ways that exhibit designers can leverage creativity in museum design.

1. What does the term “creative” mean to you as exhibit practitioners?
2. What would you want to know from youth with LD to make guidance about “creative” actionable for you?

Conundrum 4: Vocabulary

"[What did you think about the vocabulary cards?] I think it was good. There wasn't, like, that many words or, like, a long paragraph, so, like, it wasn't, like, boring, I guess."



Conundrum 4: Vocabulary

- Youth with LD expressed that complex science vocabulary at exhibits can be hard to understand/navigate. When given the opportunity to have support for complex vocabulary they were cautiously interested.
1. How do you make choices about the vocabulary used in your exhibits?
 2. What would you want to know from youth with LD to make STEM language accessible?

What's Next?

- Charette with youth and practitioners this Fall
- Resources to be posted on informalscience.org
- Please reach out!
 - Sunewan Paneto (spaneto@mos.org)
 - Calvin Uzelmeier (cuzelmeier@rmisc.org)
 - Sami Daley (sdaley@warner.rochester.edu)