Make-A-Vis: Learning Sciences Research

Advancing Public Understanding of Scientific Data

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The Creativity Labs @ UCI

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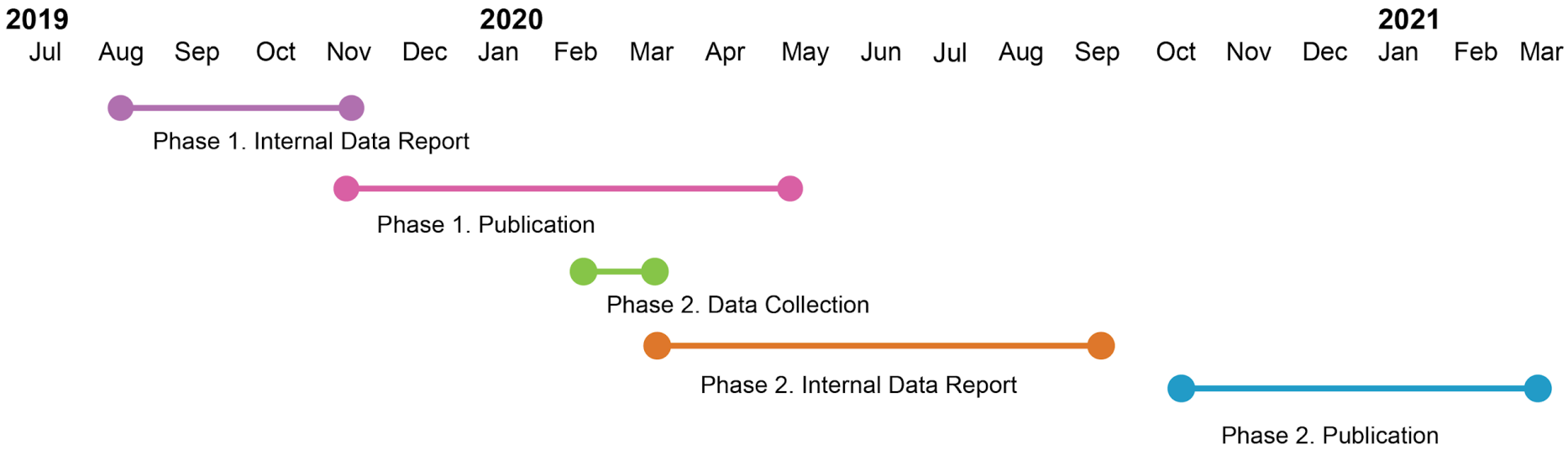
Overview

Overview of Research

Phase 1: What type of visualization personalization of the exhibit design leads people to initially engage with and maintain **engagement** with a data visualization?

Phase 2: How can we increase museum visitors' data visualization **learning** and literacy? What role does digital and physical construction play in improving learning outcomes?

Timeline of the Phases



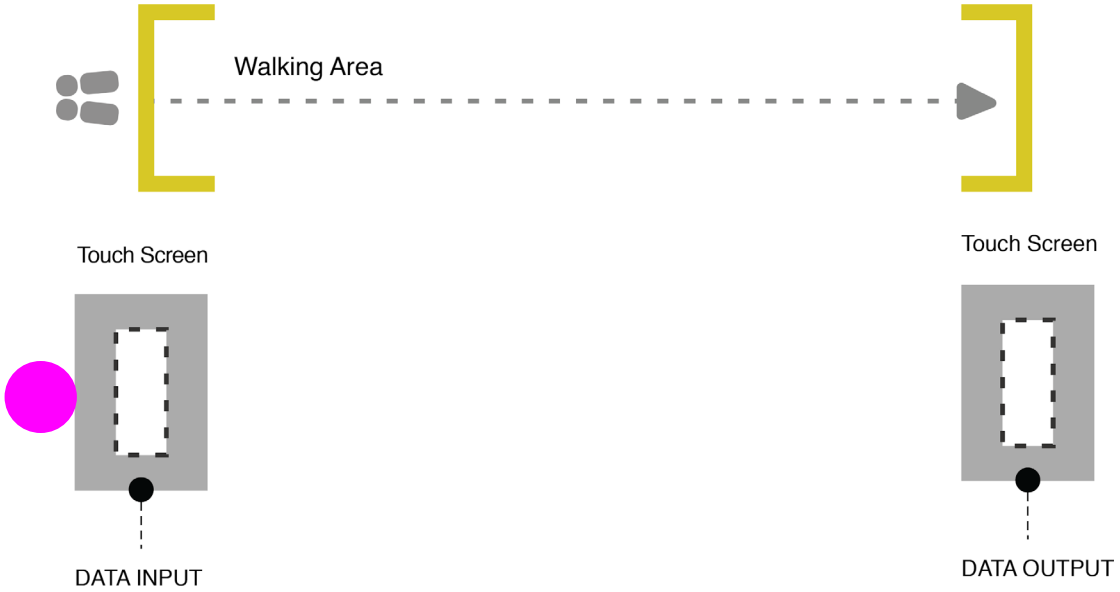
Overview of Phase 1

- Importance of data visualization literacy
- Data visualization is frequently taught with curated data sets (e.g., Lyons & Roberts, 2014)
- Within science museums the physical set-up of the exhibit plays a role in scaffolding data visualization engagement (Lyons & Roberts, 2014)

- Constructionist approaches to learning suggest that learning happens best when people construct personally meaningful projects (Papert, 1980; 1992)
- Make-A-Vis: Making meaning of personal, emergent, and real-time data
- Phase 1: Video-data analysis of purposes of engagement and physical engagement typologies at COSI with Make-A-Vis as part of the Walk exhibit

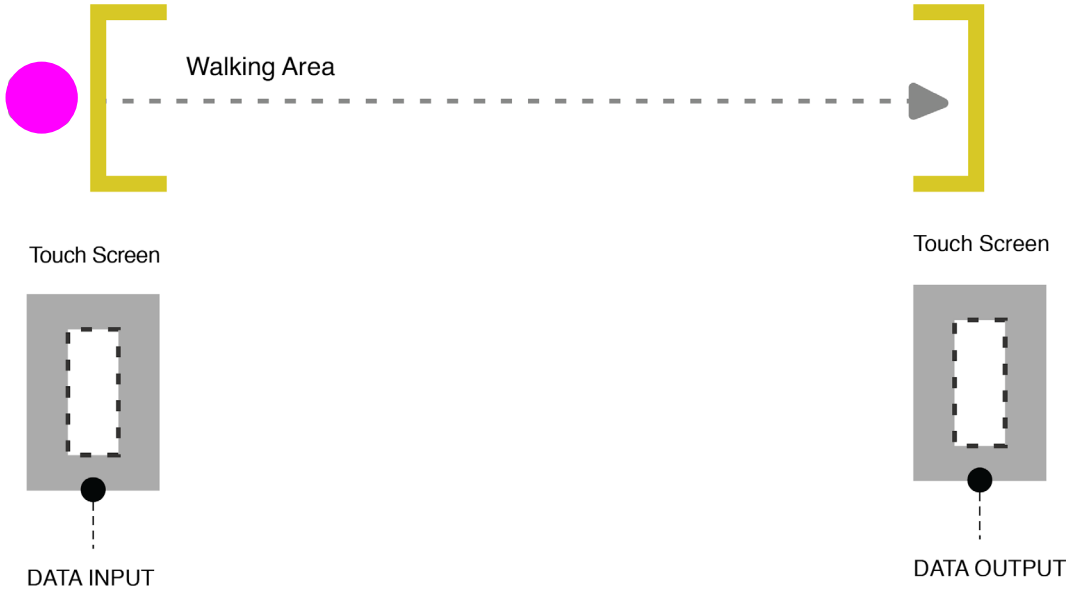
Context

Setting | Data Entry



Center of Science and Industry

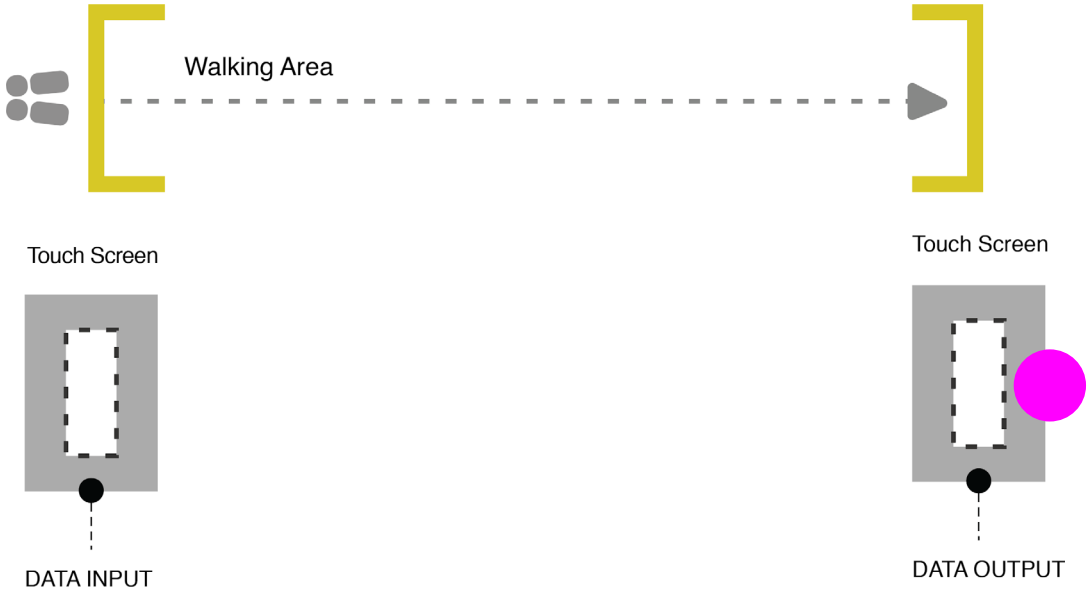
Setting | Data Entry



COSI
Center of Science and Industry

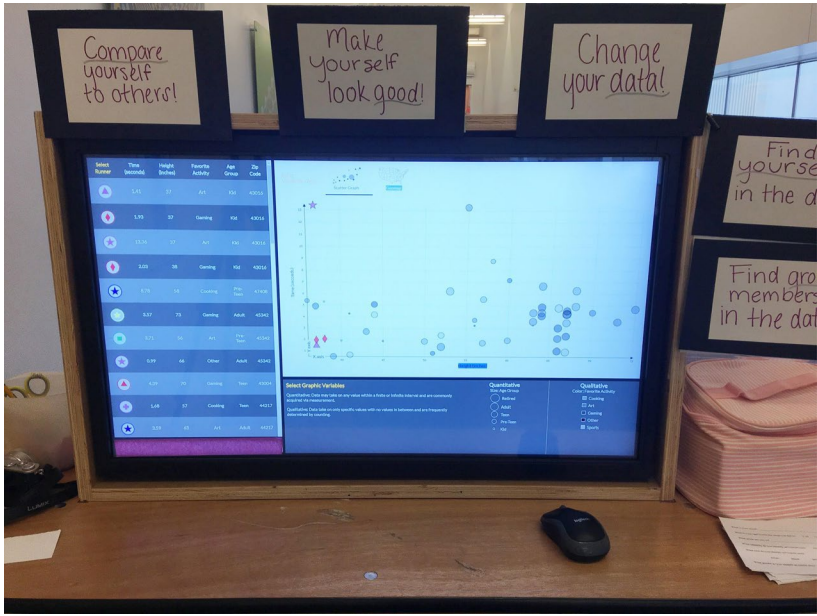
Setting | Data Entry

Setting | Data Entry



Setting | Task Types

1. Find yourself in the data
2. Make yourself look good
3. Compare yourself to others
4. Change your data
5. Find a group member in the data



COSI Center of Science and Industry

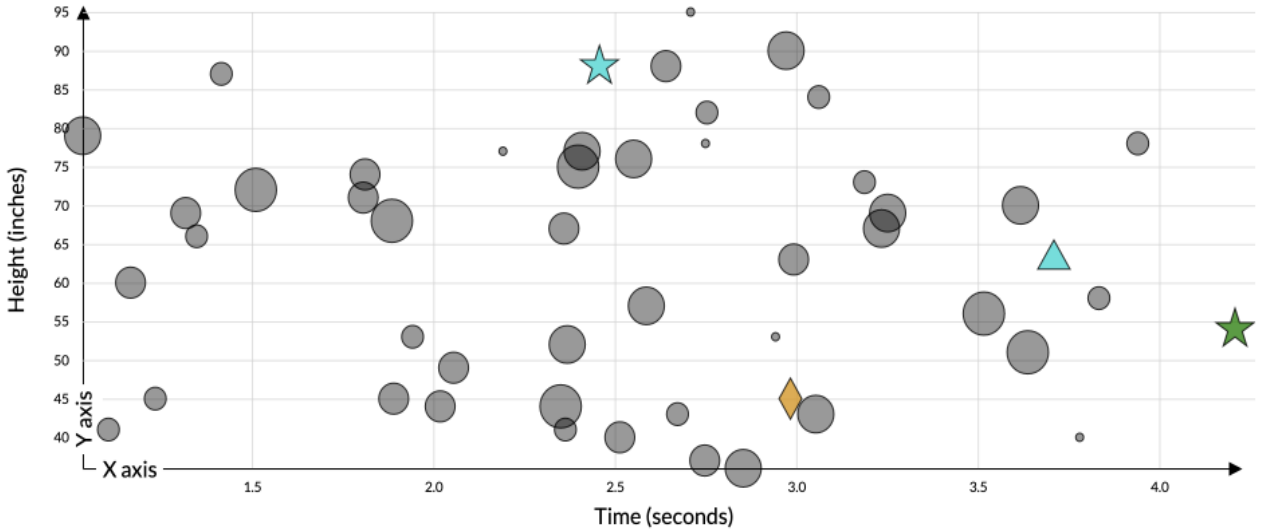
AISL xMacroscope

Home | Backend | Make A Vis | Endline

Select Runner	Time (seconds)	Height (inches)	Favorite Activity	Age Group	C
★	4.21	54	Cooking	Pre-Teen	41
▲	3.71	63	Gaming	Teen	80
◆	2.98	45	Gaming	Teen	46
★	2.46	88	Sports	Adult	85
▲	2.37	52	Cooking	Adult	39
✚	1.03	79	Other	Adult	52
★	1.10	41	Gaming	Pre-Teen	23
✚	2.55	76	Gaming	Adult	94

Select Visualization Type

Scatter Graph | Geomap



Select Graphic Variables

Quantitative: Data may take on any value within a finite or infinite interval and are commonly acquired via measurement.

Qualitative: Data take on only specific values with no values in between and are frequently determined by counting.

Quantitative
Size: Age Group
- Retired
- Adult
- Teen

Qualitative
Color: Fixed
- ☐ Fixed

Data Sources

Demographic survey

- Paper and pencil self-reports of age, race, ethnicity

Length of engagement

- Minutes of engagement: Starts at entry; ends at exit
- Number of walks

Data queries

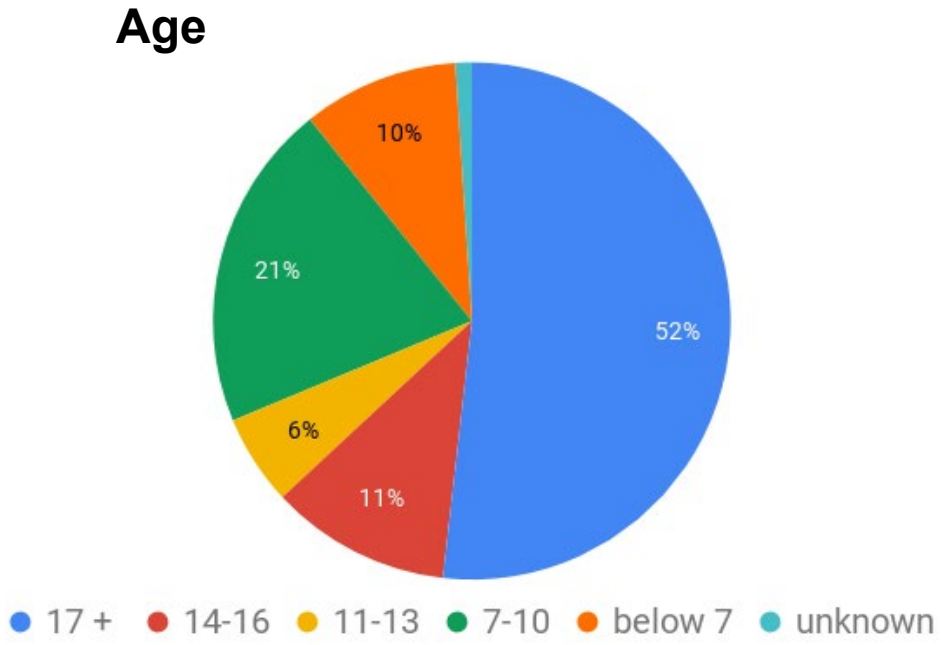
- Task types visitors engaged with

Semi-structured interviews

- What do you enjoy most about the exhibit?
- What do you find surprising about the exhibit?
- How do you recommend to improve the exhibit?

Phase 1 Participants

Number of participants (N)	195
Number of groups (N)	74
Average group size	3
Hours of observation (hours)	20



Phase 1 Participants

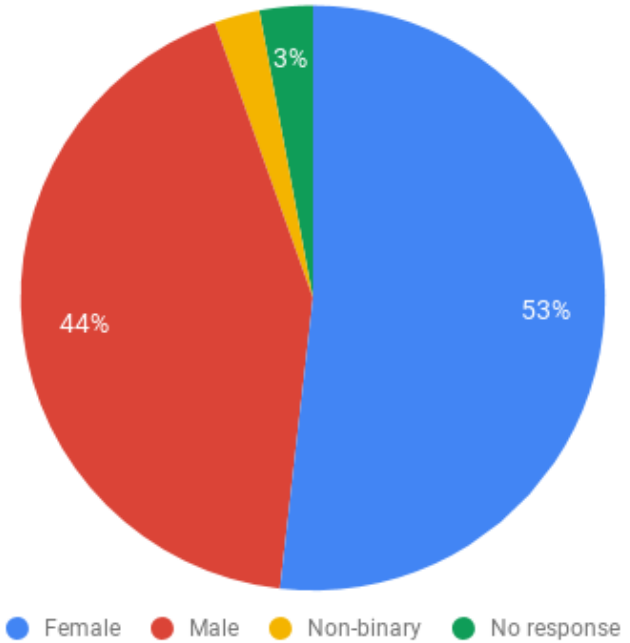
Ethnicity

Latinx	8.21%

Race

White	76.92%
Black	11.79%
More-than- one	9.23%
Asian	3.59%
Other	1.54%

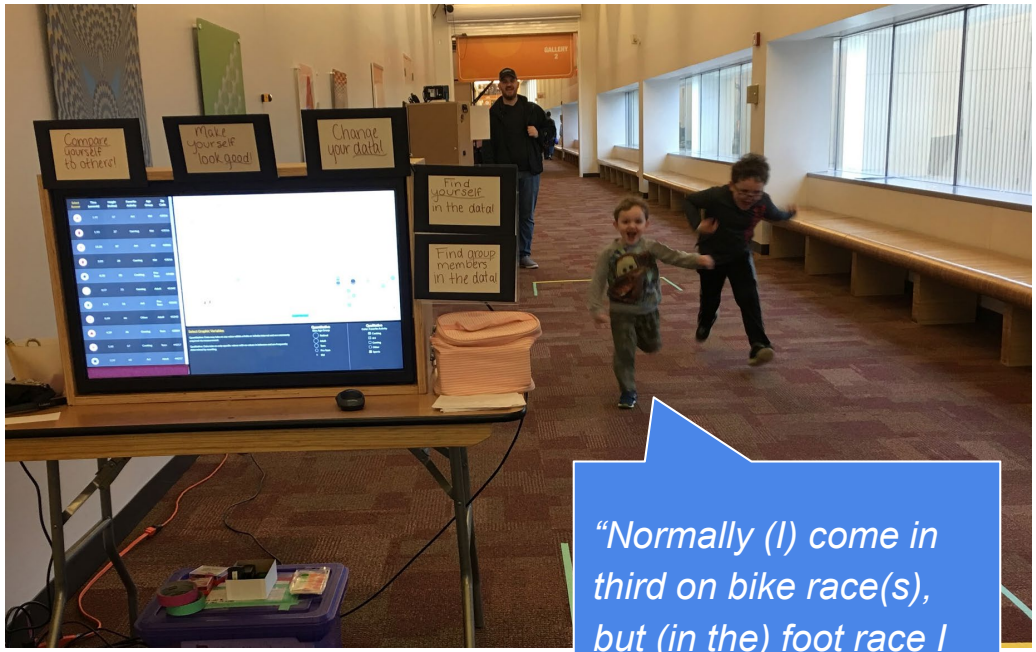
Gender



Emerging Findings

Findings: Length of Engagement

Mean dwell time	5:16 minutes
Minimum dwell time	00:40 minutes
Maximum dwell time	16:13 minutes
Average walks	3 times/group
Minimum walks	1 times/group
Maximum walks	12 times/group
No data entry walks	23 groups



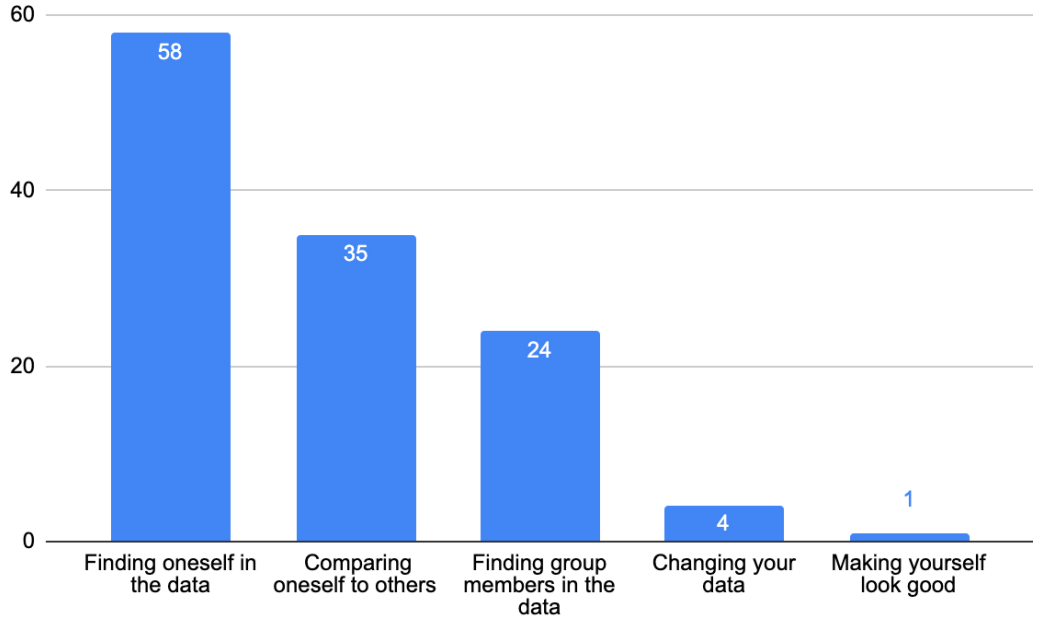
"Normally (I) come in third on bike race(s), but (in the) foot race I came in second."

Findings: Engagement with Data Exploration Tasks

Most frequent: Finding oneself in the data

“(I can) see where I live”

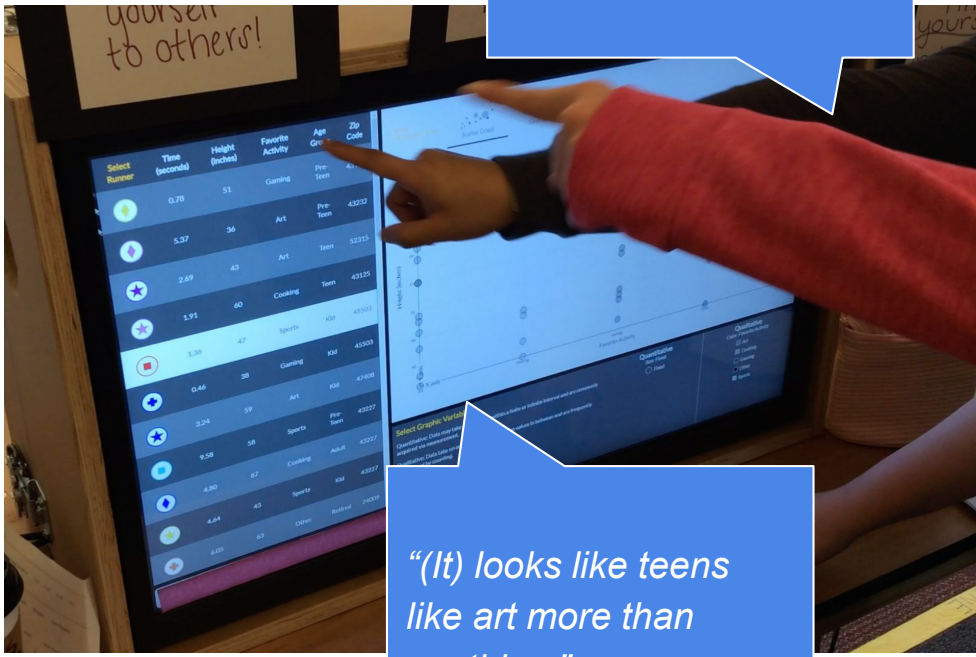
Construction of personalized data visualization can support engagement.



Findings: Comparing Aggregates

Within the emergent, real-time data set, visitors purposefully compared data cases and drew conclusions that may or may not be general truths.

It was the purposeful in vivo sense-making of real time data through comparisons that presented engagement with data visualization literacy.

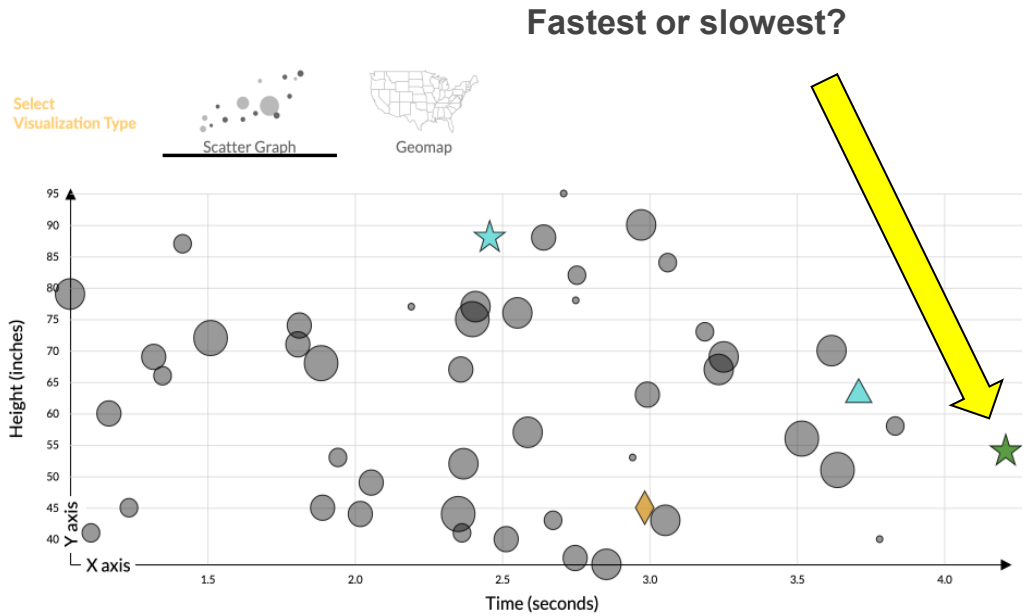


“Retired people and kids walk in (the) same pace.”

“(It) looks like teens like art more than anything.”

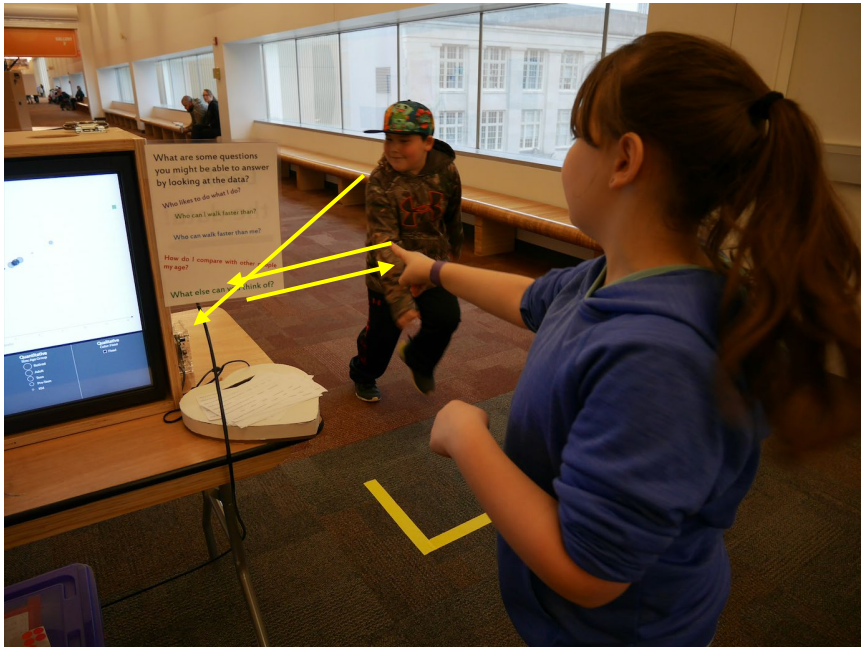
Findings: Group engagement

The spread of the exhibit in physical space made it possible for several members of a group to engage at once, through teachable moments, shared data entry, joint creation of visualizations.



Findings: Physical Exhibit Engagement

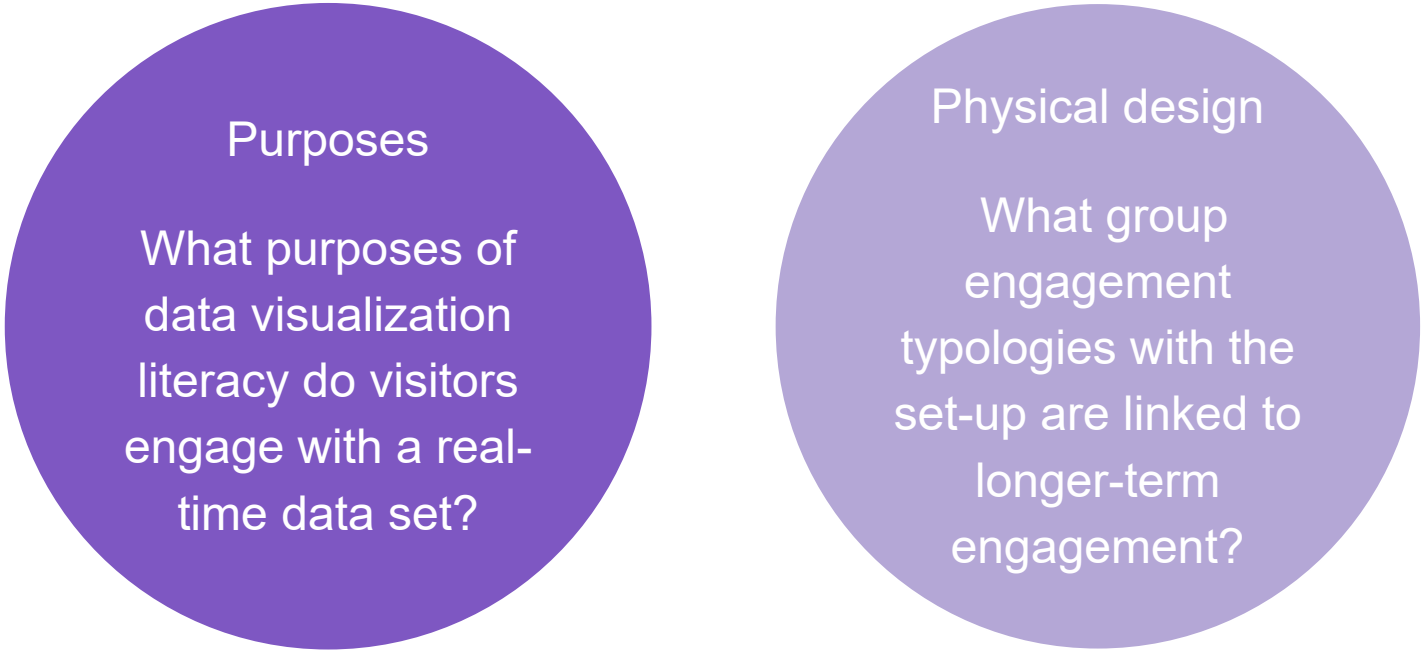
Technology transparency: The visible motion sensor lead to inquiries about input/output relationships as visitors observed the accuracy of its reading.



Moving Forward

Phase 1 Analyses under Way

Civic data visualization literacy



PHASE

2

Phase 2: Learning Objectives

After using the Make-A-Vis,

1. participants can find their own data on the screen.
2. participants can visualize data variables with graphic variable types.
3. participants can compare and cluster data points.
4. participants can explore relationships among multiple data variables.
5. participant can develop hypotheses based on recognized relationships among multiple data variable types.
6. participants can confirm or deny formed hypothesis based on the data visualization.

Thank you!

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