Museum Makers: Designing With Data

New York Hall of Science

Contents

About This Activity Guide

This guide describes what took place during NYSCI's Big Data for Little Kids workshop series, Museum Makers: Designing With Data. In addition to detailed outlines of the activities implemented during the program, this guide includes a glossary of recurrent terms and resources used throughout the workshops.

In 2017, as part of a National Science Foundation funded project, the New York Hall of Science (NYSCI) set out to teach Big Data concepts to children ages 4 – 8 years old. NYSCI developed and piloted an after-school program for families to utilize the data cycle as a method of informed decision-making that embodied NYSCI's *Design, Make, Play* approach to learning. **Design** emphasizes problem solving and intentionality, and helps you see the possibilities in the world; **Make** invites you to be hands-on with materials, tools and processes, and nurtures the development of skills and confidence; and **Play** promotes intrinsic motivation and deep engagement. All of these elements allow for open-ended exploration, innovation, imaginative learning and self-efficacy — elements that inspire passionate learners, critical thinkers and active citizens.

Using NYSCI's own exhibit floor as a place of study, children and their families worked together to collect a variety of data on NYSCI's exhibits, and then analyzed their collected data in order to answer the overarching question: "What is missing from NYSCI's exhibit floor?" After identifying the problem, children designed a solution that was relevant to them, inter-acted with an assortment of materials and tools to make their exhibit, and ultimately engaged in a variety of playful activities that promoted data literacy.

Throughout the workshops, instructors used diverse styles of data collection to create a context and purpose for the families to answer questions, analyze information, and ultimately work together to make an informed decision based on the data collected over the course of each workshop.

The workshops were based on the following topics of data science:

1. **Introduction to Data and the Data Cycle:** Understanding the purpose and process of using data to inform decision-making.

2. **Types of Data:** Exploring different assortments of data (e.g., categorical versus continuous variable).

3. **Data Collection:** Practicing different data collection methods (e.g., standard versus nonstandard units of measurement).

4. **Data Perspective:** Visualizing data from different perspectives (e.g., case value versus aggregate).

5. **Data Application:** Making sense of the data collections and implementation of design.

During each of these workshops, instructors focused on a smaller "data question" that was specific to each topic of data collection. This question scaffolded the families through the data cycle that would later help them to make informed decisions about their exhibit design.

The data cycle is a series of steps that allow for organization, interpretation and analysis of raw data.

The Data Cycle

- Ask a Question
- Collect Data
- Analyze Data
- Organize Data
- Interpret Data
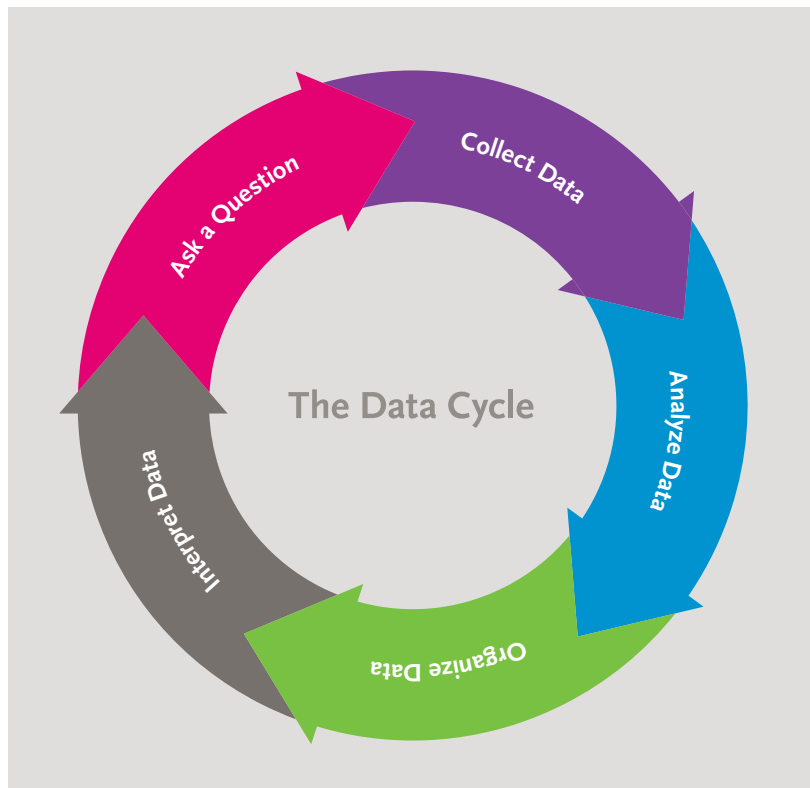
The Museum Makers: Designing With Data workshop series took place over six consecutive Thursday afternoons. The families participated in the workshop immediately after school for about two hours, concluding with dinner.

The framework of each workshop consists of four main components:

1. **Warm-Up Activity:** A playful and engaging activity that serves as practice for how the families will be collecting data from the exhibits specific to each workshop theme.

2. **Pre-Exhibit Exploration:** An overview of the specific type of data they will be collecting and why is it important for the exhibit design process.

3. **Exhibit Exploration:** A time for families to investigate the exhibits on the museum floor by collecting data on content, size, dwell time and the features that allow for user interaction.

4. **End of Day Reflections:** Each workshop ends with the families documenting their findings from the data collected during that particular workshop and using their journals to analyze, interpret and draw conclusions about the exhibit they will ultimately design.

These activities were designed to be a fun and engaging introduction to hands-on data collection and analysis for young learners. While the museum's exhibits were used as a place of study, this may not work for every version of this program. Staff at other organizations are encouraged to make use of the collections, pieces and/or artifacts that are accessible at their organizations and, along with the essence of the activities, cater it towards their institution's goals and pedagogical approach. This could mean an analysis of the collection of books at a library, or the assortment of plants at a garden — whatever will be relevant and unique to the institution's visitors.

The sixth and final workshop is a celebration of all of the hard work that the families accomplished throughout the previous sessions. Allow the families to present their work in a way that

is both meaningful and worthwhile. Provide a space to set up and display all of the new exhibits that the families designed together. Provide families with poster boards to illustrate the name, purpose and any other relevant details about their exhibits. And be sure to invite guests and staff to visit this display of Museum Makers. Encourage the children to introduce their exhibits and talk about how the data inspired their designs.

The main goal of this program is to provide the resources for young learners to feel empowered as both data scientists and exhibit engineers through the encouragement and guidance of their caregivers. Included in this activity guide are questions, strategies and prompts to help direct the discussions and reflections with both children and adults.

Lesson 1
My Favorite Exhibit

Data Question

Which exhibit is the most popular? Which exhibit is the most educational?

Goal for Children

Begin to see data as information that can help inform decisions.

Goal for Adults

Begin to pose questions that will help their children talk through their thought process.

Warm-Up Activity

Provide a welcoming activity to introduce the families to the purpose and the end goal of the workshops. Since they will be working as data scientists and exhibit designers, provide them with a notebook that they will use throughout the course of the workshop as their data journal.

Families will spend time personalizing their journals so that each individual has the opportunity to engage in their own observations, reflections and data collections. Making the data and the collection process personally meaningful will make the journal a tool that families will want to use throughout the workshop series.

Pre-Exhibit Exploration

Since most children are somewhat familiar with data, you can start a whole group discussion using the following facilitation questions:

What is data?
Where have you seen data?
Why is data important?

Since most children are not as familiar with the data cycle, spend some time going through each step of the cycle and what exactly it means to ask a question, collect, analyze data, organize data, and interpret data.

Through the data cycle, children learn to ask question and analyze information in order to arrive at an informed decision.

This is a perfect opportunity to explain the overarching project: To edit an existing exhibit or design a new exhibit that is missing from the museum's collection. Explain to families how the data collection and analysis will ultimately inform their exhibit design.

Since NYSCI is a hands-on science center, NYSCI instructors had the unique opportunity to use the exhibit floor as a place to collect data. While not every institution has as much access to their exhibits as NYSCI, there are many other ways of connecting families to a central mission. For instance, a library may ask the question, "Which book can we add to our collection?" A botanical garden may ask, "Which plant or flower is missing from our gardens?" And a school group may ask, "What type of soup should we serve in the cafeteria?"

This is a perfect opportunity to introduce an exhibit designer from your institution. They should explain what it actually means to design exhibits and all of the data that they must first collect and analyze in order to design an exhibit.

A few minutes were allocated at the beginning of each workshop for NYSCI's exhibit designer to present to the families. This gave the children the opportunity to ask questions about how exhibits are actually designed in real life.

Exhibit Exploration

The first data collection activity should be a light touch of data to both motivate and engage the families in the material. After a brief rundown of the specific exhibits that they'll be investigating, have the families explore your institution in order to become familiar with the collections or exhibits that they'll be working with in the coming weeks. The goal is for families and individuals to collect two different pieces of data — one on their favorite exhibit and the other on the exhibit that they found most educational.

In consideration of the cultural diversity of the local community, NYSCI staff were able to provide a more inclusive co-learning environment by supporting families with resources across multiple languages including English, Spanish and Mandarin.

Post-Exhibit Exploration

In order to analyze the data, it first needs to be compiled into an *aggregate* collection. An aggregate is a group or cluster formed by sorting individual items. In this case, the individual data points are the pieces of data collected by each individual or family.

To create an aggregate collection, designate one color sticky

note for the favorite exhibit and a different color sticky note for the most educational exhibit. On the board or wall, display an array of boxes, each labeled with an individual exhibit name. Have everyone write their name on the two different sticky notes and place them in the corresponding boxes to represent their "vote" for favorite and most educational.
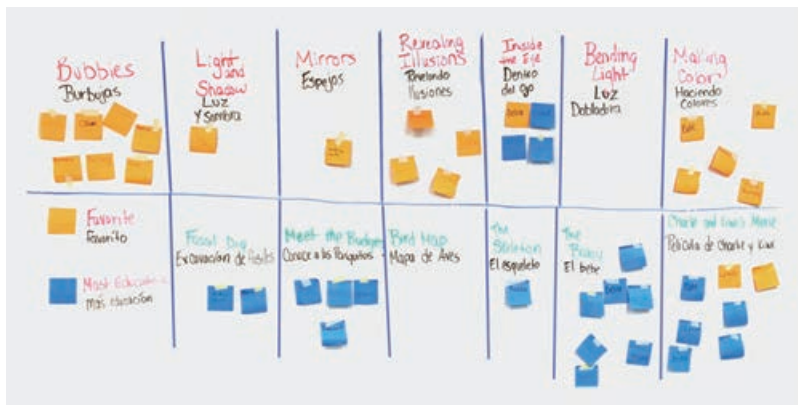
Individual data points representing the most educational and favorite exhibits.

Once all of the sticky notes are on display, facilitate a whole group discussion to model what it sounds like when you analyze a set of data. You can also model how to draw conclusions based on the data set and how to tell the story that the data is illustrating.

Facilitating questions	Sample Conclusions
• Which box/exhibit has the most [blue] sticky notes? • Which box/exhibit has the least [yellow] sticky notes?	• [ ] has the most sticky notes — it must be the crowd favorite. • [ ] has the most sticky notes — it must be the most educational.

A child reflects on their favorite exhibit and starts designing their own exhibit.
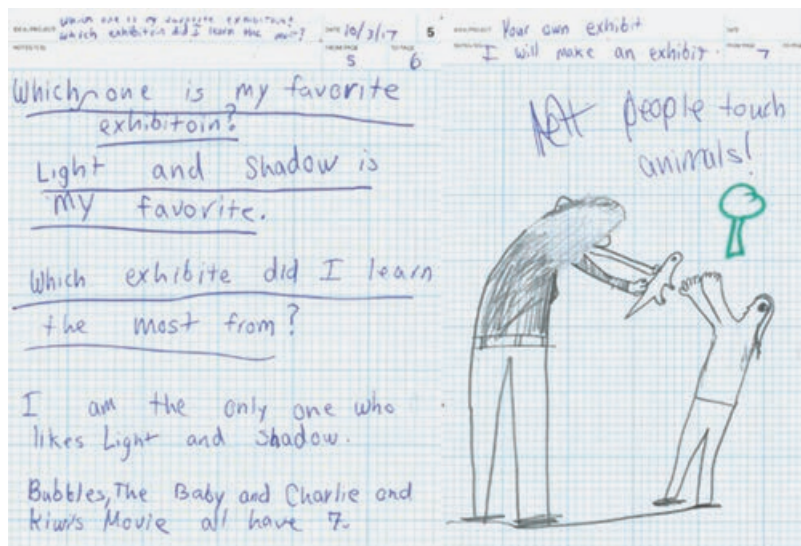
End-Of-Day Reflections

To review all of the information presented, review the data cycle and remind families that they will eventually be creating their own exhibit based on the data that they collected today and that they will collect over the course of the workshops. Have the children start designing their "dream exhibit" based on the data collected today (favorite and most educational).

Facilitating Questions

• *Why did you choose [ ] as your favorite exhibit?*
• *What do you like to do at this exhibit?*
• *Do you want visitors to learn something new at your exhibit?*

Lesson 2
Size Matters

Data Question

Which exhibit takes up the most/least amount of space?

Goal for Children

Decide which measurements are important to describe an object's size. Create their own parameters for what it means to be big/small.

Goal for Caregivers

Help children explore different ways to conceptualize size, as well as establish a plan for measuring the exhibits.
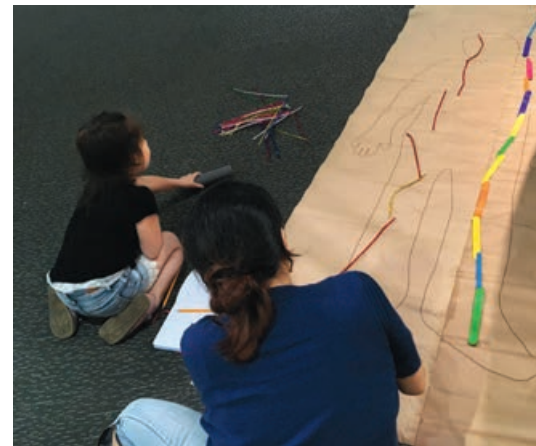
Walk-In Activity

The walk-in activity for the rest of the workshops will act as practice for what the families will ultimately be doing in a bigger scale out on the museum floor. To initiate excitement about measurement, start with an object so large that it requires many helping hands to measure. At NYSCI, instructors used a life-size body outline of one of the program facilitators. Provide families with an assortment of materials (pipe cleaners, blocks, pom poms, etc.) to serve as non-standard units of measurements.

After families have time to explore the different versions of non-standard units, facilitate a whole group discussion about how to compare the different measurements. This should lead to a conversation about the importance of standard units of measurement.

Encourage families to utilize a variety of tools and methods of measuring the large object.

Facilitating Questions

• *How many pom poms big is _____?*
• *How many blocks big is _____?*
• *Why did you need so many more pom poms than blocks to cover the length of _____ ?*
• *If I measured the height in pom poms and you measured the height in blocks, how do we know the real size?*

NYSCI's exhibit designer explains the different ways to think about size while designing an exhibit.

Pre-Exhibit Exploration

Reintroduce the exhibit designer and have them describe the ways in which they have to think about size when they are designing a new exhibit. Specific talking points should include the eye levels of children versus adults, the average arm length versus the depth of a hands-on component, and the amount of people that can fit at an exhibit at one time.

HOW BIG ARE THE EXHIBITS?

HOW FAR CAN PEOPLE REACH?

Before the families move onto the museum floor, review the measuring device that they will be using and be sure to talk about the specific unit of measurement that everyone will be using.

Since most measuring tapes provide both inches and meters, be sure to choose one standard unit for every family to use. This discussion is particularly important because of the cultural differences that occur among museum visitors.

Allow the families time to discuss a plan for how they will decide to measure each exhibit.

This is the part of the workshop where the facilitator can shift the responsibility over to the caregivers and have them help their child plan out how they are going to measure the

To keep track of their measurements, supply families with a photo of each of the exhibits that they will be measuring.

different exhibits. Remind them that there is no right answer and that however their child decides to measure is simply how they are interpreting the concept of size.

Once they have discussed and decided on a plan for how they will measure the exhibits, families can move onto the exhibit floor.

Exhibit Exploration

Once they are on the museum floor, families will use the measuring tool to measure the exhibits in the manner that the children decided upon with the assistance of their families.

Families can record their measurements and keep track of their measured locations on the photos and in their journals.

Post-Exhibit Exploration

Similar to the array of boxes in the first lesson, families will be consolidating their data points into an aggregate collection. This time, the aggregate will be large photos of the exhibits that the families measured on the museum floor.

On these photos, each family will use a different color marker to illustrate exactly which part of the exhibit that they measured and its corresponding measurement.

To create an aggregate collection, designate one color marker per family and have them transfer their findings from their photos to the larger photo so that everyone's measurements for the same exhibit will be displayed together.

End-Of-Day Reflections

To recap all of the information presented today, review the significance of size when designing an exhibit, as well as the steps of the data cycle that you went through up until this point.

Since the last step in the data cycle is to interpret the collected data, allow the families time to reflect on their experiences and findings throughout the activity and how size will factor into their exhibit design, while also thinking about the data

Each photo will serve to some extent as a blueprint with a variety of lines and measurements.

Families transferred their measurements to one large aggregate collection.
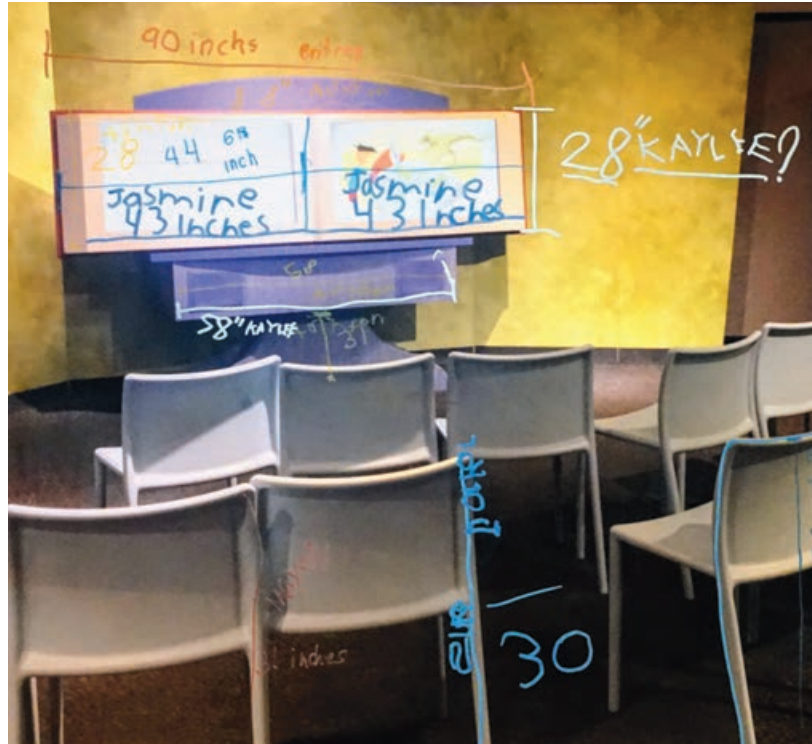
question: *Which exhibit takes up the most/least amount of space?* You can facilitate a whole group discussion about the data that they collected today, and any conclusions that they may have made.

Facilitation Questions

- *What can you tell me about the sizes of the different exhibits?*
- *Do you think the exhibits were designed for adults or children? For one person or a group of people?*
- *What type of visitors/audience do you want to design your exhibit for?*
- *How will you make/provide room for people to interact/enjoy your exhibit?*

Have the families revisit and refine their initial drawing to factor in their conclusions about size.

Lesson 3
Time Counts

Data Question

Which exhibits do people spend the most/least time at?

Goal for Children

Create their own parameters for what it means for a duration to be long and short.

Goal for Adults

Open and facilitate a conversation so that their child can think out loud about what it means to be long/short or fast/slow.

Warm-Up Activity

Before introducing this warm-up activity, initiate a whole group discussion about the different ways in which a visitor can interact with an exhibit. This can include anything from reading information or directions to manipulating pieces or physically participating in an activity.

Remind families that through their design process they will ultimately have to decide how much time a visitor will/can spend interacting with their exhibit. The data that they will be collecting in today's activity will help them see the varied amount of times visitors spend at different exhibits. This data will ultimately help them decide the duration of activity they will incorporate into their exhibit design.

Facilitating Questions

- *What type of activities will you design for your exhibit? (reading activity, hands-on activity, both?)*
- *How much time will it take for visitors to interact with your exhibit?*
- *Can visitors move around or do they need to go through the whole thing?*

Have the families practice measuring time by providing them with a variety of tabletop activities that mimic the different styles of the exhibits.

Activities can include puzzles, mazes, ball runs, copies of exhibit directions, passages or information that visitors may encounter on the exhibit floor. Children can take turns timing each other and their families to see how much time it takes to complete the different style of activities. Feel free to incorporate a variety of timers such as stopwatches, kitchen timers and sand timers. This will provide children with a variety of measurements that they can choose to help with their design decisions.

Pre-Exhibit Exploration

Before the families move onto the exhibit floor, reintroduce your exhibit designer and have them speak specifically about the significant role that time plays when they are designing a new exhibit. Specific talking points should include how much initial text or directions are required to comprehend their exhibit, how many steps a hands-on activity will take to complete, and how many different activities are available at one particular exhibit.

Before the families head out onto the museum floor, review the stopwatch and the one specific unit of measurement that everyone will be using. In order to create a simple aggregate, seconds is the most efficient unit for the children to make comparisons.

Exhibit Exploration

Once on the museum floor, families will use the stopwatches to measure the amount of time it takes to complete different activities at different exhibits. Again, children can take turns timing each other and other family members.

Facilitating Questions

- *Does it take adults and children the same amount of time to go through the same exhibit?*
- *How many different activities did you time at this one exhibit? Did you time them separately or together?*
- *Are different types of activities longer or shorter than others?*

Post-Exhibit Exploration

Similar to the array of boxes in the first lesson and the blueprints in the second lesson, families will be consolidating their data points into an aggregate collection. This time, the aggregate will be arranged on a continuous timeline.

On the board, draw a single line from left to right to represent the spectrum of time. Families will place their data anywhere on the line where they feel it is most appropriate.

The data points form an aggregate collection on a timeline.

Each data point will be represented by the exhibit name and the corresponding measurement of time.

Families can write each individual data point on a sticky note and then decide where it belongs on the spectrum of time.

This is the part of the workshop where the facilitator can shift the responsibility over to the caregivers and have them help their child plan out how and where they are going to place their sticky notes. They can ask questions about why they chose to place the note in that location and how it compares to the other notes around it. It may be challenging for young children to decide where to place their data, especially with mixed unit (e.g., minutes and seconds). Caregivers should take this opportunity to help their child better understand basic ideas of number line and number comparison.

End-Of-Day Reflections

To recap all of the information presented today, review the significance of time when designing an exhibit and the steps of the data cycle that you went through during until this point.

Since the last step in the data cycle is to interpret the collected data, allow the families time to reflect on their experiences and findings throughout the activity and how time will factor into their exhibit design while also thinking about the data question: *Which exhibits do people spend the most/least amount of time at*? You can facilitate a whole group discussion about the data that they collected today, and any conclusions that they may have made.

Facilitating Questions

- *What can you tell me about the different amounts of time people spend at exhibits?*
- *How many activities do you think you'll design in your exhibit?*
- *How much time do you want visitors to spend at your exhibit?*

Have the families revisit and refine their initial drawing to factor in their conclusions about time.

Lesson 4
Special Features

Data Question

Which features do you interact with at the exhibits?

Goal for Children

Create their own criteria of what they consider significant in each category, i.e. is a chair a movable part?

Goal for Caregivers

Open a conversation so that the child can think out loud about what it means to be categorized as each feature.

Warm-Up Activity

Before introducing the walk-in activity, initiate a whole group discussion about the different features that a visitor can interact with at an exhibit. This can include any features that your exhibits have such as buttons, lights, sound, text, etc.

Remind the families that through their design process, they will have to decide which interactive features they will be incorporating in their own exhibit. The data that they will be collecting in today's activity will help them see the varied amount of modes of interaction at different exhibits. This data will ultimately help them decide which features and how many they will incorporate into their exhibit design.

Facilitating Questions

- *What do you notice at each exhibit? Does _____ count as a feature?*
- *Which type of features will you including in your exhibit? (lights, buttons, switches, etc?)*
- *Will visitors be walking through or sitting at your exhibit?*
- *How will visitors know how to interact with/what to touch at your exhibit?*

In order to become familiar with the different features, provide families with a variety of tangible items that mimic the different features of the exhibits. After rolling a die to designate a number of each feature that they will use, they can create a toy to share with their family. Children can then share out the toy that they created and how each of the different features on it work.

The aggregate display of the data represented by the children's toy designs. Each row represents a different child's design and the number of each feature included in their design.

LEDs	Buttons	Push Lights	Pipe cleaners	Springs	Sound	Straws	Clips	Spinner	Wheels
1	3	1	3	3	3	1	2	3	1
3	3	1	2	1	2	3	1	2	2
3	3	3	1	2	2	3	2	2	3
3	2	3	1	1	3	3	2	2	2
2	1	1	2	3	3	2	2	1	1
3	3	3	1	2	3	1	2	3	2
1	3	2	1	2	3	1	3	3	1
1	1	2	1	2	1	2	1	2	2
1	1	3	1	1	3	2	2	2	2
1	1	3	2	1	3	3	1	3	2

Facilitating Questions

- *As you look at your toy and describe it to everyone, what are some of the features that make it work?*
- *Now, think about how the same things that we can describe in an exhibit — what makes each exhibit work?*

Pre-Exhibit Exploration

Before the families move onto the exhibit floor, reintroduce your exhibit designer and have them speak specifically about the important role of different interactive features when they are designing a new exhibit. Specific talking points should include why they choose certain features over others, how they would like the visitors to interact with each exhibit, and how many features it will take to make the exhibit work.

Before the families head out onto the museum floor, review the list of features from the previous activity. These will be the same items that they will collect data on out on the museum floor. Assign one exhibit to each family and provide a copy of the list so that they can record the total number of each feature in their journal.

The aggregate collection of data collected on exhibit features.

Each family will be responsible for collecting data on one specific exhibit.

Exhibit Exploration

Once on the museum floor, families will count the number of each feature present at one specific exhibit. (i.e., *The movie for Charlie & Kiwi's Evolutionary Adventure has 12 chairs.*)

Facilitating Questions

- *What do you notice at this exhibit?*
- *How did you get this exhibit to work?*
- *Is _____ a feature at this exhibit?*

This is the part of the workshop where the facilitator can shift the responsibility over to the caregivers and have them help their child analyze the features at their assigned exhibit. They can ask questions about how they can interact/play at the exhibit, and what they think counts for each feature at this specific exhibit. *(i.e., Is a chair a movable part? Can you count how many different sounds are part of this exhibit?)*

Post-Exhibit Exploration

Similar to the array of boxes in the previous lessons, families will be consolidating their data points into an aggregate collection. This time, the aggregate will be a grid representing each exhibit as compared to each feature.

Once all of the exhibit features are accounted for, you can ask some probing questions to motivate the children to analyze variety and number of features used throughout the different exhibits.

Facilitating Questions

- *Which exhibit has the most/least features?*
- *Do any of the exhibits have all of the features?*
- *Which feature is used the most/least?*

End-Of-Day Reflections

To recap all of the information presented today, review the importance of features when designing an exhibit and the steps of the data cycle that you went through up until this point.

Since the last step in the data cycle is to interpret the collected data, allow the families time to reflect on their experiences and findings throughout the activity and how the different interactive features will factor into their exhibit design, while

Children may decide to identify that certain features simply exist instead of totaling the amount within the exhibit. This can be labeled as a √ / X, or a yes/no method.

also thinking about the data question: Which features do you interact with the exhibits? You can facilitate a whole group discussion about the data that they collected today, and any conclusions that they may have made.

Facilitating Questions

- *What type of features will you be adding to your exhibit design? (lights, buttons, switches, etc?)*
- *Will visitors be walking through or sitting at your exhibit?*
- *How will visitors know how to interact with/what to touch at your exhibit?*

Have the families revisit and refine their initial drawing to factor in their conclusions about interactive features.

Lesson 5
Designing With Data

Data Question

What can you add to/what is missing from the museum's exhibits?

Goal for Children

Analyze all the previously collected of data.

Goal for Caregivers

Facilitate a conversation around all of the previous data questions in order to decide on a design.

Warm-Up Activity

The final warm-up activity is a walk through a gallery of artifacts, illustrating all of the hard work the families have done throughout the workshops. The artifacts can include copies of journal work, pictures of families collecting data at the exhibits, and the various tools used to collect data.

Station 1:

What is the most favorite exhibit? What is the most educational exhibit?

Tools: Data Cycle poster, photos of each exhibit, list of exhibit names

Artifacts: Journal entries, photos of families during exhibit exploration, copies of aggregates

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Station 2:

Which is exhibit takes up the most/least amount of space?

Tools: Measuring tapes, yard sticks, etc.

Artifacts: Journal entries, photos of families during exhibit exploration, copies of aggregates

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Station 3:

Which exhibits do people spend the most/least amount of time at?

Tools: Stopwatches, sand timers, etc.

Artifacts: Journal entries, photos of families during exhibit exploration, copies of aggregates

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Station 4:

Which features do you interact with the exhibits?

Tools: Lights, switches, buttons, etc.

Artifacts: Journal entries, photos of families during exhibit exploration, copies of aggregates

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The gallery walk can be set up so that the families rotate around four tables — each table will represent one of the four previous weeks of data collection. Be sure to display each week's data question as a reminder of the focus of that particular workshop.

The families can rotate around and reminisce about all of the data that they collected as it applies to their designs.

This is the part of the workshop where the facilitator can shift the responsibility over to the caregivers and have them help their child make concrete connections between the data that they collected and the decisions they are making throughout their design process.

Once the designs are finalized, the families can get started on making their exhibits that they will present during the final workshop.

Glossary

Exhibit	An object of interest as an individual component of a larger display.
Exhibition	A collection of exhibits under one overarching theme.
Exhibit Feature	The element or object by which the user and an exhibit interact (text, lights, moveable parts, buttons, etc.).
Exhibit Designer	A person who creates displays and fixtures for large exhibitions, shows, businesses, museums, libraries and galleries.
Exhibit Interaction	The means by which the user and an exhibit interact.
Engineering Design Process	A series of steps that engineers follow to come up with a solution to a problem.
Activity Duration	How long it takes a person to complete the activity.
Reading Activity	An activity within an exhibit where a person looks at and understands the directions, instructions, passages, etc.
Hands-On Activity	An activity within an exhibit where a person is manipulating various parts in order to complete a task.
Table-Top Activity	Games that are typically played on a table or other flat surface, such as board games, card games, dice games or tile-based games.
Tangible Items	Any object within an exhibit that can be perceptible by touch.
Data	Information such as facts and statistics that are collected together in order to help come to a conclusion or decision.
Measurement	The size, length or amount of something, as established by measuring.
Unit	A quantity chosen as a standard in terms of which other quantities may be expressed.
Data Point	One individual and identifiable element in a data set.
Blueprint	A drawn-up plan that models the size of the eventual design.

Glossary *(continued)*

Standard Units of Measurement	Units of measurement that are typically used within each measurement system, such as inches, feet, ounces, pounds, kilograms or cups.
Non-Standard Units of Measurement	Units of measurement that aren't typically used, such as a pencil, an arm, a toothpick or a shoe.
Aggregate Data (Verb)	To form or group individual data points into one large class set.
Aggregate (Noun)	A collection of separate and individual items. Each data point is one individual item and as the families compile their points, it becomes an aggregate collection.
Data Scientist	A person who studies and knows how to extract meaning from and interpret data.
Conceptualize	Making sense of data.
Measuring Tools	An instrument or device for measuring a physical quantity (i.e. stopwatch, ruler, measuring tape, etc.).
Array (of boxes)	Objects/numbers arranged in rows and columns.
Continuous Timeline	An uninterrupted linear representation of time.

Glossary *(continued)*

What Is Data?

Data is information that helps us answer a question and make a decision. Before we decide what to wear in the morning, we collect various points/types data to help influence our decision. This can include listening to the weather report from the TV and radio, checking a weather app on a digital device, and considering everything that you plan to do throughout the day. For example, if it had stopped raining earlier in the morning, you might decide to wear waterproof boots in case of puddles, and not carry an umbrella since it has already stopped raining.

What Is the Data Cycle?

The Data Cycle is a multi-step process that uses collected and analyzed data to help an individual arrive at an informed decision. The first step of the data cycle is to ask a data question. This question should be able to be answered by the forthcoming steps of the data cycle – collecting data, analyzing data, organizing data, and then interpreting data. For example, to answer the question: *"What type of soup should we serve in the cafeteria?,"* students would be able to collect information from their classmates and teachers, analyze the data to decide how it will be organized, and then ultimately decide on a type of soup by interpreting the data.

What Does Data Mean for Adults?

While adults are already very familiar with data and its influence in their everyday life, they may not be aware of how often they are actually using data. Deciding what to serve for dinner is a great entry point for parents. The data collected for this decision can include time, which ingredients are readily available, the family members that will be eating, and what the family had for dinner on the previous day.

For the adults, the workshops provided entry points to start a conversation about data, and more importantly the tools to maintain the conversation.

What Does Data Mean for Children?

While children should already be familiar with inquiry-based science activities, they may not be familiar with the ways that they are already using and interacting with data. Many of the activates that a student engages in on a typical school day are already an abbreviated or disordered version of the data cycle. For example, a student may participate in a conversation about the weather, decide on their choice for lunch by using a polling system, measure objects within the classroom, and organize teams for a game with classmates.

For the children, the workshops provide a context for engaging in hands-on data science and a structure for using that data to answer a specific question.

Tips for Caregivers

How Can You Help Your Child?

- In this workshop, there are no right or wrong answers! We're here to learn about the observations your children make about the world around them and how they make sense of their observations.

- As we collect and look at data, take the time to think about what you notice, and before you share your ideas, take the time to ask your children what they notice.

- Get excited about what they say. Allow ample time for your children to think through the questions, as well as time for them to talk through their ideas and answers.

- Instead of including your ideas in a question, see what ideas your children have first.

  Example

  Do you see any blue in this picture?

  versus

  What do you notice about the color in this picture?

- Instead of asking questions that have a yes/no or one word answer, try asking questions that require more a longer explanation.

Consejos Para Los Cuidadors

Come Puede Ayudar a Su Hijo/Hija?

- ¡En este taller, no hay respuestas correctas o incorrectas! Estamos aquí para aprender acerca de las observaciones que sus hijos hacen sobre el mundo que les rodea y cómo hacen sentido de estas observaciones.

- Al recopilar y mirar los datos, tome el tiempo para pensar en lo que usted observa. Antes de compartir sus ideas, pregunte a sus hijos lo que ellos notan, tambien.

- Emocionese con lo que dicen sus hijos. Deje tiempo suficiente para que sus hijos piensen en las preguntas, así como tiempo para que puedan hablar de sus ideas y respuestas.

- En lugar de incluir sus ideas en una pregunta, vea qué ideas tienen sus hijos primero.

  Ejemplo

  ¿Ves el color azul en esta foto?

  vs.

  ¿Qué notas sobre el color de esta foto?

Guiding Questions

It's okay to struggle!

Ask them one of these questions and be sure to allow them time to think about their answer.

- How could we work together to solve this?
- Tell me about what you built, made, created…
- What do you notice about ____?
- How would you organize this data?
- What do you think about ____?

  Why do you think that?

Preguntas orientadoras

¡La lucha es parte del aprendizaje!

Hágales una de estas preguntas y asegúrese de darles tiempo para pensar

- ¿Cómo podriamons trabajar juntos para resolver esto?
- Dime lo que construistes, creaste....
- ¿Que observas acerca de ____?
- ¿Cómo organizarías estos datos?
- ¿Qué opinas sobre ____?

  Por qué piensas eso?

Translations

To provide a more inclusive learning experience for our local neighborhood, the workshops were presented in both Spanish and English. We've included the following translations of words commonly associated with the data topics as organized by their associated workshop.

My Favorite Exhibit

Data / Datos

Data Cycle / Ciclo de Datos

Ask a Question / Haz una Pregunta

Collect Data / Recolectar Datos

Analyze Data / Analizar Datos

Organize Data / Organizar Datos

Interpret Data / Interpretar Datos

Museum / Museo

Exhibit / Exhibición

Journal / Diario

Aggregate (Verb / Noun) / Agregar / El conjunto

Design (Verb / Noun) / Diseñar / un Diseño

Make / Hacer

Educational / Educativo

Translations

Size

Size / **Tamaño**	
Room *(Location / Space)* / **Cuarto** / **Espacio**	
Measure *(Verb / Noun)* / **Medir** / **Medida**	
Measurement / **Medición**	
Big / **Grande**	
Small / **Pequeño/a**	
Tall / **Alto/a**	
Short / **Corto/a**	
Wide / **Amplio/a**	
Narrow / **Estrecho/a**	
Tool / **Herramienta**	
Measuring Tape / **Cinta Métrica**	
Ruler / **Regla**	
Visitor / **Visitante**	
Adults / **Adultos**	
Children / **Niños**	
Conclusion / **Conclusión**	
Inches / **Pulgadas**	
Feet / **Pies**	

Time

Time *(Verb / Noun)* / **Cronometrar** / **Tiempo**

Most / **Más**

Least / **Menos**

Spend / **Gastar**

Long / **Longer** / **Largo** / **Más Largo**

Fast / **Faster** / **Rápido** / **Más Rápido**

Slow / **Slower** / **Lento** / **Más Lento**

Interact / **Interactuar**

Reading / **Leyendo**

Hands-on / **a Mano**

How Much / **Cuánto Cuesta**

Amount / **Cantidad**

Duration / **Duración**

Beginning/Start / **Comenzando** / **Comenzar**

End/Finish / **Fin** / **Terminar**

Puzzle / **Rompecabezas**

Directions / **Direcciones**

Activities / **Actividad**

Second / **Minute** / **Segundo** / **Minuto**

Stopwatch / **Timer** / **Cronómetro**

Clock / **Reloj**

Translations

Features

Features / *Características*	
Category / *Categoría*	
Toy / Play / *Juguete / Jugar*	
Buttons / *Botones*	
Lights / *Luces*	
Sound *(Verb / Noun)* / *Sonar / Sonido*	
Text / *Texto*	
Touch / *Tocar*	
Read / *Leer*	
How Does It Work? / *¿Como Funciona?*	
Total Amount / *Cantidad Total*	
All / *Todos*	
None / *Ninguno / Nadie*	
Count / *Contar*	
How Many? / *¿Cuántos?*	
Grid / Chart / *Cuadrícula / Gráfico*	

Designing

Add to / *Añadir a*	
Missing / *Faltar*	
Change / *Cambiar*	
Improve / *Mejorar*	
Stations / *Estaciones*	
Rotate / *Girar*	
Reminisce / *Recordar*	
Reflect / *Reflejar*	
Decide / Decision / *Decidir / Decisión*	
Conclude / *Concluir*	
Making / *Haciendo*	
Build / *Construir*	
Create / *Crear*	

Acknowledgements