



SUMMATIVE EVALUATION:

CONSTRUCTION ZONE EXHIBITION

Prepared for the
Miami Children's Museum
Miami, FL

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SUMMARY AND DISCUSSION

This report presents the results of a summative evaluation of the *Construction Zone* exhibition conducted by RK&A, Inc. for Miami Children’s Museum (MCM). The exhibition was funded in part by the Institute of Museum and Library Services (IMLS). The following Summary and Discussion section is organized into two main sections: 1) overall visitor experiences; and 2) visitor experiences with three exhibits in the *Construction Zone*—the Excavator Activity, Bridge-building Station, and Keva Plank Station. The discussion is guided by the evaluation objectives (see Study Background section).

The findings presented here are among the most salient. Please read the body of the report for a more comprehensive presentation of findings.

STUDY METHODOLOGY

This summative evaluation is focused on understanding the effect of the exhibition on **walk-in visitors to MCM** (hereafter referred to as “visitors”). RK&A used two methodologies, described below, to understand walk-in visitors’ experiences with the exhibition.

EXIT INTERVIEWS



- ◆ 51 interviews with visitors after exiting the exhibition
- ◆ Mostly adult participants and a few children
- ◆ Open-ended questions
- ◆ Audio-recorded and transcribed
- ◆ Qualitative data; results analyzed through content analysis

UNOBTRUSIVE OBSERVATIONS



- ◆ Focused observations of visitors at three exhibits:
 - Excavator Activity
 - Bridge-building Station
 - Keva Plank Station
- ◆ Observed visitor behavior & conversations inconspicuously
- ◆ Qualitative data; results analyzed through content analysis

VISITOR EXPERIENCES IN THE EXHIBITION

OVERALL IMPRESSIONS

Overall, data indicates that *Construction Zone* inspires interest in and excitement about building and design processes and construction careers among visitors. The exhibition simulates the environment of a construction site (e.g., through the Excavator Activity and Construction Site Spin Browser) and encourages visitors to become builders and create their own structures (e.g., through the large foam blocks and other building stations in the Design Studio). Visitors value the “interactive” nature of the exhibits in *Construction Zone*, and interviews and observations indicate that these “hands-on” experiences help children get excited about construction activities and imagine themselves in construction careers by building and discovering how different construction machines work.

In particular, interview data indicate the Traffic Flow Wall and the large foam blocks are two of the most interesting exhibits for visitors. Both are located near the main entrance to the exhibition and their large scale immediately grabs visitors’ attention and invites them to explore the exhibit further. Interviewees noted that both the Traffic Flow Wall and large foam block exhibits are appealing and easy to use for a wide range of ages and developmental stages. For example, the museum’s youngest visitors are excited by watching the balls circulate through the tubes of the Traffic Flow Wall and pop out of different exit points, while older children enjoy placing the balls into the tubes, using the levers to change the ball’s course, and catching the balls as they pop out of the tubes. The large foam blocks exhibit takes something familiar to children of all ages, building blocks, and makes it “larger than life.” The scale gives children a new experience stacking and connecting building blocks to construct their own large-scale creations.

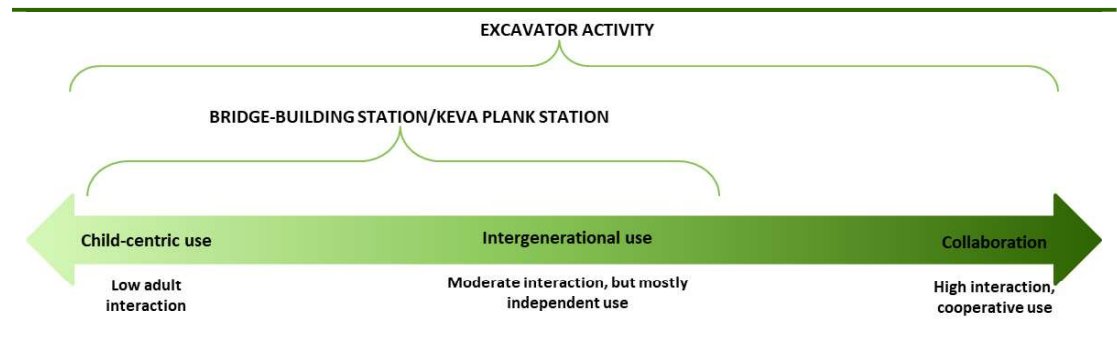
While visitors are excited to participate in some of the hands-on experiences in *Construction Zone*, there are parts of the exhibition that appear to be under-utilized. For example, few named areas on the Design Studio side of the exhibition (e.g., the Lego, Keva Plank, and Bridge-building stations; DecoRate Miami; Design a House; and Gears +) as a favorite part of the exhibition, and observations indicated periods of time where few or no visitors were using the building stations (although other parts of the exhibition were busy). One potential barrier to visitors engaging with the building stations in the Design Studio is that when all the building materials are put away, it is hard to tell at a glance what visitors are supposed to do in the space. All storage bins are opaque, which hides the different types of building materials available, and there are no pictures or models that show examples of things that can be built with the materials in the exhibition. Observations indicated visitor traffic to the Design Studio was higher when there were materials visible on the tables, others visitors were actively using the materials, or structures were on the tables from past visitors (as compared to when materials were stored away). Switching to clear storage bins for building materials, adding a few pictures of example creations and/or displaying a few simple models using each type of building materials could serve to draw visitors in and help them understand how to use the space.

COLLABORATION

MCM was interested to explore how intergenerational groups use exhibits together in *Construction Zone*. As noted in RK&A’s 2017 summative evaluation of MCM’s *Music Makers* exhibition, intergenerational experiences with exhibits exist on a continuum, with child-centric, independent use (low or no adult interaction) on one end of the spectrum and collaboration (high adult-child interaction and teamwork) on the opposite end of the spectrum. At the center of the continuum, intergenerational use includes some collaboration among adults and children, some moments when adults stand back to let children use exhibits alone, as well as some occasions of parallel play (adults and children using the same exhibits together but independently).¹

Results indicate that *Construction Zone* supports experiences across the continuum for intergenerational use. Interview data suggest adults appreciate the variety of levels of interaction for using the exhibits with their children because it allows for “autonomy” and building independence (e.g., young visitors are excited to insert a ball into the Traffic Flow Wall by themselves) but also playing together as a family (e.g., building a “car” together with the large foam blocks). At the Bridge-building Station and Keva Plank Station, observation data indicate groups most often use the exhibits independently or in parallel play, and seem satisfied with this type of interaction (perhaps because the open-ended nature of the exhibits encourages a focus on an individual’s creative process). Visitors’ use of the Excavator Activity spans the whole continuum, with older children (age 5+) and adults able to operate the Excavator independently, and younger children (under age 5) needing adult support because the crane arm is challenging to move. Overall, *Construction Zone* provides a healthy mix of opportunities for adults and children to engage with one another in play (or not), depending on their preferences.

CONSTRUCTION ZONE OFFERS OPPORTUNITIES ACROSS THE INTERGENERATIONAL USE CONTINUUM



¹ “Summative Evaluation: *Music Makers* Exhibition.” Prepared for Children’s Museum of Miami, 2017.

VISITOR EXPERIENCES BY EXHIBIT

EXCAVATOR ACTIVITY

The Excavator Activity is a popular exhibit for visitors of all ages, encourages different levels of intergenerational use (mostly driven by a child's age and size because of the physical challenges of using the exhibit), and has a promising dwell time (most visitors spent at least one minute using the exhibit). The bright yellow color and large size of the Excavator stir excitement among visitors and simulate the experience of operating machinery at a construction zone for children. Moreover, the multiple pivot points and levers, coupled with the weight of the metal Excavator arm, encourage problem-solving and reasoning to understand how to move and scoop sand with the arm.

However, the weight of the Excavator arms also presents a barrier to use for younger, smaller children (particularly if the adult in their group is with another child elsewhere in the exhibition). In addition to having one Excavator at a low height for small children, perhaps MCM could consider scaling down the size and/or weight for small children to operate, or consider adding a step stool in front of the low-height Excavator so that it is easier for short children to reach the levers and leverage their weight to operate the arm.

Excavator Activity Strengths and Challenges

STRENGTHS

- **Bright color and large size excites and attracts visitors**
- **Simulates the feeling of construction site**
- **Encourages problem-solving and teamwork**

CHALLENGES

- **Difficult to operate, particularly for small children**



BRIDGE-BUILDING AND KEVA PLANK STATIONS

Both the Bridge-building Station and Keva Plank Station are successful in offering open-ended opportunities for visitors to experiment with building materials and use creativity to design and build structures. Observations indicate that when building materials are easily visible on station tables or others are using the space, visitors are more likely to use the stations (than when materials are hidden in storage bins) and enjoy building and testing out different designs. Visitors work on their own and occasionally in groups, and a few become intensely focused as they use these exhibits, staying for over 10 minutes.

While visitors who use the Bridge-building Station and/or Keva Plank Station often enjoy their experience and stay for at least one minute, the primary challenge for both stations is attracting visitors. First, it is difficult to compete with the large foam block exhibit centrally located at the main entrance to the exhibition, where the blocks are large and the intended activity (building with the blocks) is clear. Next, as noted above, visitors are sometimes unsure what they can do in the Design Studio space when all materials are put away (as indicated in both observations and interviews). However, there may be some simple ways to help visitors understand how to use the Bridge-building Station and Keva Plank Station (e.g., clear storage bins, displaying example models) and attract them into the space

Bridge-building and Keva Plank Station Strengths and Challenges

STRENGTHS

- Encourages creative thinking and experimentation with building materials
- Some visitors become deeply engaged in designing and building structures



CHALLENGES

- Attracting visitors to use stations
- Competition with large foam blocks nearby



CONCLUSION

Construction Zone provides many opportunities for visitors to explore the construction field through hands-on design and building activities (e.g., large foam blocks and Design Studio) and realistic encounters with construction machines (e.g., Excavator Activity and Construction Site Spin Browser). While there is already promising evidence of problem solving, experimentation with building materials, and collaboration, there are opportunities to further strengthen the exhibition by helping visitors connect with building activities in the Design Studio and making the Excavator Activity easier for the museums' smaller visitors to use.

STUDY BACKGROUND

Miami Children’s Museum (MCM) contracted RK&A to conduct a summative evaluation of the *Construction Zone* exhibition, which was funded in part by the Institute of Museum and Library Services (IMLS). The exhibition aims to “create an engaging, educational, interactive experience to introduce children to concepts of science, technology, engineering, and math as related to the construction of buildings and architectural structures” (MCM IMLS Grant Narrative).

This evaluation is purposefully focused on understanding the effect of the exhibition on **walk-in visitors to MCM** (hereafter referred to as “visitors”). Specifically, the objectives of the evaluation are to explore:

- ◆ How visitors use/experience the exhibition, including:
 - How, if at all, adults and children (ages 3+) experiment with building (e.g., various structures/materials) in the exhibition;
 - How, if at all, children (ages 3+) demonstrate problem-solving and reasoning skills when using activities in the exhibition;
 - How, if at all, adults and children collaborate in the exhibition (on a continuum from child-centric, low adult interaction to highly collaborative adult-child interaction when using exhibits/completing activities);
 - How adults and children use/experience the Excavator Activity, Bridge-building Station, and Keva Plank Station specifically.
- ◆ What ideas visitors take away from the exhibition (with particular consideration to the intentional lack of signage in this exhibition), including:
 - In what ways, if at all, children become interested in or excited about construction (including design, architecture, and/or engineering).

METHODOLOGY

Two methods were employed for the summative evaluation: exit interviews and focused observations.

EXIT INTERVIEWS

RK&A conducted 51 open-ended interviews with a random selection of adult visitors exiting the *Construction Zone* exhibition over three days in July and August 2019; children occasionally participated in the interview, too. Open-ended interviews encourage interviewees to express their opinions, understandings, and the meaning they construct from experiences using their own words (as opposed to the language of the evaluator or researcher). The interviewer conducted the interview using an interview guide (see Appendix) to frame the discussion and asked probing and clarifying questions as necessary. Data collection included a mix of weekdays and weekend days. All interviews were conducted in English. Interviews were audio-recorded with participants' permission and transcribed to facilitate analysis.

FOCUSED OBSERVATIONS

On two weekdays in July, RK&A also conducted focused observations of three exhibits in *Construction Zone*—the Excavator Activity, Bridge-building Station, and Keva Plank Station. Focused observations look at an individual exhibit or sections of an exhibition in-depth. The data collector observed visitors and recorded notes on behaviors and conversations taking place at the exhibit/space. The observations were guided by the intended outcomes of the exhibition. Note that all ages cited in the observation findings are based on the evaluators best estimate, as observations were unobtrusive so visitors were not asked to report their ages. Time spent by visitors at each exhibit during observations are estimates rounded to the nearest 10 seconds for stops under one minute and the nearest whole minute for stops over one minute.

ANALYSIS AND REPORTING

The interview and observation data are qualitative, and results are descriptive. In analyzing the interview data, the evaluator studied the interview notes for meaningful patterns and grouped similar responses as patterns and trends emerged. The objectives of the study, as well as our professional experience, informed the analysis. Findings are reported in narrative and trends and themes in the data are presented from most- to least-frequently occurring. The findings are supplemented with quotations (edited for clarity) to illustrate participants' thoughts and ideas as fully as possible.

When describing the findings, this report uses qualitative data terms such as “most” and “several,” as is appropriate for the sample size and the type of data collected. Proportions, such as one-half or one-third, are used where appropriate. Such descriptive language is intended to provide readers with a sense of the general trends. Readers should regard the trends as general categories rather than rigid numerical counts.

INTERVIEW FINDINGS

RK&A conducted 51 interviews with 54 participants.² Most interviews were one-on-one with an adult visitor, a few were with an adult and child. The participation rate for interviews is 66 percent.³ Of the participants:

- ◆ **Age of participants:** Adult participants range in age from 21 to 59 years. Median age is 33 years.⁴ Of the three children who participated in the interviews, one was 4 years old and two were 5 years old.
- ◆ **Ages of children in visit group:** Children in visit groups ranged in age from 0 to 14 years. The median age is 4 years.⁵
- ◆ **Number of children in visit group:** Over one-half were visiting the museum with two children; over one-third were visiting with one child; several were visiting with three or more children in their group.
- ◆ **Residence:** Nearly one-half live in Miami;⁶ one-third live in Florida but outside Miami; a few are visiting from other states and territories;⁷ and a few live outside the United States.⁸

THE SAMPLE

RK&A ran statistics to compare MCM interview participants and refusals by participant age and age of children in the visit group to understand the representation of the sample. RK&A found visitors age 18 to 34 were more likely to participate in an interview than visitors age 35 or older. Given the difference between participation and refusal by participants' age, the sample may not be entirely representative of the experiences and perceptions of visitors age 35 and older. This should be kept in mind while considering the findings presented.

² The data collectors conducted 57 interviews, but six interviews conducted during instrument pretest and data collector training were removed from analysis.

³ The participation rate is calculated by dividing the number of visitors/visitor groups who agreed to participate in the interview (51) by the number of all eligible visitors/visitor groups recruited (77). Visitors who declined the interview owing to language are ineligible and not calculated in the participation rate. There were 22 visitors/visitor groups who were ineligible due to language barriers; the majority of these were believed to be Spanish-speaking.

⁴ Mean adult age is 34 years.

⁵ Mean child's age is 4 years.

⁶ Including Miami, Miami Beach, and North Miami Beach zip codes.

⁷ Other states/territories of residence are Missouri, New York, New Jersey, and Puerto Rico.

⁸ Other countries of residence are Brazil, Denmark, and France.

MOTIVATION FOR VISIT

Interviewees were asked what motivated them to visit the museum that day. Motivations were varied and included:

- ◆ **Something fun for the kids:** Nearly one-half said they came to the museum because it seemed like “something fun” to do with kids. Many of these responses were general, but a few of these said their child specifically requested to come to the museum.
- ◆ **Visiting from out of town:** One-fifth said they were visiting Miami and looking for kid-friendly activities or something different than “going to the beach.”
- ◆ **Visited museum before:** Several said they have visited the museum before and/or are members of the museum.
- ◆ **Enriching environment:** A few said they were visiting because the museum provides a “learning” experience for their child and “makes them use their brains.”
- ◆ **Recommended by family/friend:** A few said they came because someone they know recommended the museum.
- ◆ **Miscellaneous motivations:** A few gave miscellaneous reasons for visiting, such as their child’s birthday and the weather.

SOMETHING FUN FOR KIDS

“The kids wanted to do something, so I took them [here] because they love it. They have the little activities in here, you know. They can experience so many different things.”

VISITING MIAMI

“We come here every year [from France] over summer break. Every year we cross the bridge and we see the Children Museum. We were waiting for our child to be at least two years old, so now, it's her first experience to visit today.”



WHAT DID VISITORS LIKE MOST?

Interviewees were asked what they liked most about the *Construction Zone* as adults, and what they thought their children liked most. Interviewees often named specific parts of the exhibition (e.g., the Traffic Flow Wall), but also highlighted certain types of experiences they enjoyed (e.g., the interactive experience of building). Many mentioned more than one favorite part in their response. Responses for both adults and children's favorites are presented below together, with differences between the two groups highlighted when relevant. Responses included:

Traffic Flow Wall: Over one-half said the wall with pressurized air tubes representing the highway systems in Miami was a favorite (for both adults and children). Several said they liked this exhibit because it was unique from what they have experienced elsewhere (at other museums or with toys at home). A few groups with young children (3 years and younger) said they liked that their child could experience the exhibit just by looking at it (i.e., watching the balls circulate through the tubes and pop out at the end). A few also mentioned liking the “interactive” levers that change the course the ball takes through the tubes.



TRAFFIC FLOW WALL

“ [I liked] the autonomy. The child can push the ball inside by themselves. And especially because the path is not always the same with the ball, I think it was very interesting. Very innovative.”
-Adult with child (age 2)

“ I did like that the contraption here with the vacuum. You circulate the air, the vacuum, from one side to another [and the balls] channel through the conduits. I think that was pretty neat. [My son] liked it a lot, too.”
-Adult with children (ages 2 months and 4 years)

Building experiences: Over one-half said they liked that the exhibition has many opportunities for children to engage in “building” or “designing.” There are many types of building materials available in the exhibition, but the favorite by far were the large foam blocks at the center of the exhibition. Interviewees said they (and their children) liked the large foam blocks because they are “big and child-friendly” for both younger and older children, and because building is open-ended and allows for visitors to “build whatever we want, it doesn’t matter the form or how it looks.” Also, a few each said they liked the Lego, Keva Plank, and Bridge-building stations.

Excavator cranes: One-quarter (particularly those with children over 3 years) said they liked the Excavator cranes where visitors could control the arm of the crane to scoop and pour sand, because it was large-scale (compared to small construction truck toys at home), interactive, and helped them learn about “how to work machines.”

Watching their child play/explore: Several adults said they most enjoyed watching their child(ren) play and explore in the exhibition. These responses were mostly general, but suggested that the adult was mostly supervising or observing their child, rather than playing alongside their child.

Other parts of the exhibition: A few said their child’s favorite part was the Design a House magnet activity; two said their child liked the Construction Site Spin Browser; and one adult said they liked the Gears + station with the light switches.



BUILDING EXPERIENCES

“ I liked the foam [building blocks]. I thought it was a really unique thing that they could play something big and it was soft, and you could build something creative. So I liked that the most. That was hands-on.

-Adult with children (ages 6 and 8)

CONTROLLING EXCAVATOR CRANES

“ [I liked] that the boys got to interact with [the cranes]. They’ve always played with the little one at home, so [in the exhibit] they got to really manage it with their hands. And kind of tell that there’s two different levers that do two different things, and they have to work it out to actually move the cranes.”

-Adult with children (ages 5 and 8)



WHAT DID VISITORS LIKE LEAST?

Participants were asked what about the exhibition they liked least, or if there was anything about the exhibition that did not work well for their group. Responses included:

- ◆ **Nothing:** One-quarter could not think of a part of the exhibition they liked least.
- ◆ **Working the Excavator crane:** One-fifth said their child had difficulty using the Excavator cranes because of the Excavator's size and the weight and stiffness of the levers makes it "hard to maneuver." Many of these had children 3 years or younger, but a few groups had older children as well.
- ◆ **Design Studio activities:** One-fifth said the Design Studio side of the exhibit (with the Lego, Keva Plank, and Bridge-building stations) was their least favorite part. They said there were "not a lot of things to touch," "it's not very clear how to use it," or they didn't think their child liked building activities in general. A few (with children under 3 years) said the building activities were more appropriate for older children.
- ◆ **Large foam blocks:** Several said they encountered issues in the area with the large foam blocks, mainly that the blocks are heavy for toddlers to lift and the area can get crowded so groups "cannot finish anything their doing" before someone else knocks it down or takes pieces away.
- ◆ **More explanation:** A few said they wished there was a staff member in the exhibition to orient them to the space and "help you understand what you are looking at" (e.g., what to do with the Keva Planks).
- ◆ **Construction Site Spin Browser broken:** Two said they did not get to try the Spin Browser because it was broken.



EXCAVATOR CRANES HARD TO MOVE

“Probably [our least favorite was] the crane. It's very limited mobility and it's kind of hard for them to maneuver, so I think they get over it real quick. I mean, as an adult, you can handle it, but I think as a kid, just the way it's positioned – I think it's a great idea, but the mobility is very hard for them to maneuver.”

-Adult with children (ages 5, 6, 8, 9 and 10)

⁹ Building materials are stored in plastic bins nearby workstation tables, and thus are not always visible to visitors when they enter the space.

TAKEAWAYS FROM THE EXHIBITION

Participants were asked what they thought the museum wanted them to experience in the exhibition. This question was intended to help participants articulate their main takeaway from the exhibition. Some participants mentioned more than one takeaway. Responses included:

- ♦ **Hands-on building and design:** One-third said the goal of the exhibition was to create an “interactive” building experience that helps children learn about building (e.g., putting pieces together to build something new). A few mentioned “design” specifically (e.g., thinking about “how things work” and how small changes can lead to creating “something completely different”). Interviewees said they mainly got these ideas from the building activities, with most referencing the large foam blocks and Lego station, while a few said the Bridge-building Station and the Traffic Flow Wall brought out ideas about construction design.
- ♦ **Exposure to construction and construction processes:** One-quarter said the exhibition was supposed to introduce children to construction and construction processes by seeing “real-life” construction machines like the Excavator cranes, different kinds of building materials, and watching the time-lapse video of a construction site on the Construction Site Spin Browser.
- ♦ **Using creativity and imagination:** Nearly one-quarter said the exhibition is about stimulating children’s creativity through open-ended building experiences that let children’s “imagination run wild” and allow them to “create whatever they want.”
- ♦ **Construction careers:** Several said the exhibition is intended to show children different types of construction careers and could encourage them to become a “builder” or “architect.” Again, interviewees referenced the building activities, and one mentioned the Construction Worker Role Play area where children can try on construction outfits.
- ♦ **Generally educational and fun:** Several gave general responses about the exhibition being “educational,” “fun,” or “good” for children.
- ♦ **Not sure:** A few were not sure what was the main takeaway from the exhibition.



HANDS-ON CREATION

“ Just for the kids to really understand that you can build blocks of things. You can put two objects together, and add a third of something completely different...And then you can see cause and effect, like if you change one thing, it’s something new.”
-Adult with child (14 months)

THOUGHTS ABOUT CONSTRUCTION

Participants were asked how, if at all, the exhibition made you think about how people plan, design, or build structures. Responses included:

- ◆ **Exhibition parts show many sides of construction:** Nearly one-half cited examples from across the exhibition that made them think about planning, designing, and/or building structures, with the most common examples being the Construction Site Spin Browser video of a construction site, the Excavator crane, and the Traffic Flow Wall. A few also mentioned the DecoRate Miami exhibit with the building shapes outlined on the wall and corresponding building blocks to build the outlined structure; the Inside Wall showing insulation, pipes, and wiring that run behind drywall; and the Construction Worker Role Play area.
- ◆ **Nothing:** Over one-quarter said they did not think about how people plan, design, or build structures while in the exhibition. Several of these explained that they were too busy watching their children to be able to think about the messages of the exhibition. One said seeing “real” building materials, rather than using toys like Legos, would better communicate what real construction is like.
- ◆ **Participating in the construction process:** Several said they thought about construction through “actually experiencing doing pieces of their work,” like operating the Excavator arm or building a structure in the Design Studio. For example, one said when using the Keva Planks to build a tower you have to think about the design and how you will stack them up.
- ◆ **Construction is challenging:** A few said the exhibition made them realize that construction work requires a lot of effort. For example, one said “it takes a lot if you are planning and building, more than people think it does.”

WHOLE EXHIBITION COMMUNICATES CONSTRUCTION IDEAS

“The way [the exhibition] has, the sketches, so the steps on how you start from the bottom and work your way up to the top. And the dirt over there [with the Excavator crane]. It's very interesting, especially for kids. They see that real dirt is there, and naturally that's what we use and we like real dirt. . . . And showing the kids the hard hats and the little clothes that they get to wear. It really does showcase what you guys are trying to portray here.”

-Adult with child (age 5)

DID NOT THINK ABOUT PLANNING, DESIGNING, OR BUILDING

“I mean, not really. I'm on a different planet right now with my kids. We bring them here to have fun much more than us to think about it. You build with the Lego and it falls down. You know what I'm saying?”

-Adult with children (ages 5 and 5)

OBSERVATIONS

Observations focused on three exhibit areas in the *Construction Zone* exhibition—the Excavator Activity, Bridge-building Station, and Keva Plank Station.¹⁰ The evaluator observed visitor behavior and conversations in the exhibit areas, with special attention to dwell time at exhibits; how, if at all, adults and children collaborated when experiencing these exhibits; and exhibit-specific objectives.

EXCAVATOR ACTIVITY



EXHIBIT DESCRIPTION

The Excavator Activity is a scaled-down excavator crane that visitors can operate to dig and move “sand” around an imaginary construction site. There are two Excavators at the exhibit. One is positioned at a lower level for shorter children and the other is higher for taller children. Each Excavator pivots left to right and has two levers for visitors to operate—one moves the crane arm up and down and the other operates the scoop function at the end of the arm.

OVERALL EXPERIENCE

Visitors to *Construction Zone* are typically drawn to the Excavator Activity from the main entrance of the exhibition, although a few come to the exhibit from the side entrance to the Publix exhibition because the exhibit is visible from the fish market area. The large bright yellow machines accompanied by the backdrop of images of real excavators on a construction site attract visitors to the exhibit, as well as its proximity to the popular Traffic Flow Wall. There

¹⁰ Note that museum campers were present during part of the observations of the Bridge-building Station and the Keva Plank station. Thus, not all observations are of walk-in visitors.

were visitors using the Excavator Activity exhibit consistently throughout the evaluator's observation period.

Visitors often use the Excavator activity in a group of two or more, typically with at least one adult in the group. Particularly in groups with children age 3 or younger, an adult helps the child operate the arm and the levers because young children do not have the strength or body weight needed to use the exhibit (even at the lower height). For example, the evaluator observed a few young children hanging on a lever with their full bodyweight (feet off of the floor) and still unable to make the Excavator crane move. Adults often lift smaller children up onto the ledge next to the Excavator crane to give them a better view and help them reach the levers. Operating the exhibit is easier for older, taller children, but even they often need help from an adult to operate the levers. In a few cases, the evaluator observed children (particularly those having trouble moving the arm) reach down into the sand and move it with their hands or scoop it into the claw. There were also some instances where the sand level was too low in parts of the sand pit so it could not be scooped into the claw.

During the observations, most visitors used the Excavator activity for between one and three minutes. A few, particularly those 3 years or younger, used the exhibit for just a few seconds before they realized they could not make it move or were attracted to the Traffic Flow Wall adjacent to the exhibit. And, one persistent young visitor (about age 4) who was using the Excavator Activity (first by herself and then with a slightly older child) stayed for over 10 minutes.

COLLABORATION

The evaluator observed visitors working in groups of two or more on most occasions when using the exhibit (most often an adult/child pair). As noted above, oftentimes a child *needs* an adult in order to operate the exhibit (they would be physically unable to do so without the help of an adult or another child). In some ways, the difficulty for a child to use the exhibit alone because of the weight of the crane arm works to the exhibit's advantage, as one of the goals for the exhibit is collaboration between adults and children. In many cases, the evaluator observed visitors working collaboratively, with the adult offering physical or verbal support, or both (e.g., the adult operated one lever while the child operated the second lever, or the adult providing verbal instructions, such as "turn it this way, and now open it up").

However, there were also a few instances when a child (typically younger or small in stature) tried to use the exhibit on their own (e.g., while the adult in their group was in another area of the exhibition, or standing to the side on their phone) and could not make it work by themselves. In these cases, the child lost interest or became frustrated and moved on to something else. And, on a couple of occasions, older children (about age 5 or 6) refused help from anyone else to use the exhibit because they wanted to do it on their own. Thus, while the difficulty of moving the crane arm encourages some groups to work together, it may inhibit some who want to use the exhibit alone or when other members of a visit group are otherwise occupied.

PROBLEM-SOLVING

One exhibition-specific goal for the Excavator Activity is to engage visitors' problem-solving and reasoning skills. The evaluator observed many instances of visitors using their reasoning skills to understand how to operate the Excavator arm. In particular, the multiple levers and swivel points allow for visitors to discover different ways to move the claw and ultimately figure out how to combine the movements to scoop and move sand. Sometimes visitors reasoned on their own through personal trial and error and other times by talking through the process with another visitor (usually someone in their own visit group) or observing others' actions. For example, one child (age 3) and adult approached the exhibit, and the child first tried to operate the arm on her own. When she could not move the levers with her own strength, the adult joined and demonstrated how to move the arm and scoop with the claw while the child watched. Then, the child tried again to operate the Excavator, imitating what she has seen the adult do, and with the adult's help to pull the levers, they scooped and moved some sand with the claw. In the instance of the child who spent over 10 minutes using the exhibit (noted above), the child slowly figured out the functions of the levers over time (first reaching into the sand with her hand and tossing it into the claw, then moving the arm up and down, and eventually learning to scoop using the claw with the help of the older child).

BRIDGE-BUILDING STATION



EXHIBIT DESCRIPTION

The Bridge-building Station is a section of the Design Studio side of *Construction Zone* located in the rear right corner of the space. This area includes bins with colorful wooden sticks and connectors and a low table-top with holes to insert the sticks to create a structure. While the station is referred to as the Bridge-building Station by MCM staff, the intent of the exhibit is much broader—for visitors to build any structure (it doesn't have to be a bridge) using the materials provided. In some cases, during the observations, all materials were stored away in the bins and the tabletops were clear, and in other cases, parts of a structure and building materials were on tabletops, visible to visitors.

OVERALL EXPERIENCE

The Bridge-building Station is one building activity of many on the Design Studio side of the exhibition (which also includes stations for Legos, Keva Planks, and magnet shapes). There were many times during the observation period when no one was using the station, particularly if all the materials were put away. Visitors seemed more likely to go over to the Bridge-building Station when some of the building materials were out of the bins on the tabletop, or when there was a partially constructed structure started on the tabletop. Otherwise, visitors tended to use other activities where the materials were already out. In a few cases, the evaluator started a structure with the building materials to encourage use of the station.

Children (typically age 3 or older) often used the Bridge-building Station alone, with another child, or under the observation of an adult (rather than the adult building something with the child). Visitors understood that they could use the tabletop holes to anchor the sticks (perhaps because they could see how others had done this). They often added to existing structures that had been abandoned by a previous visitor or replaced the structure with their own. On a couple of occasions, visitors created several different structures over the course of using the exhibit.

Visitors' time spent using the Bridge-building Station varied widely. As noted above, if all building materials were put away, visitors were less likely to walk over and start building a structure. Of those that did use the station, some stopped for only a few seconds, some stopped for several minutes, and one group stayed for over 15 minutes.

COLLABORATION

Collaboration varied among those using the Bridge-building Station. A few children used the exhibit by themselves and seemed content building structures on their own (e.g., they were not looking around for support from another child or adult and seemed to easily understand how to put pieces together). The evaluator observed two instances of child-only groups using the exhibit together. In one case children used the exhibit side by side (i.e., without much, if any, conversation between children) and in one case two children (campers) joined another camper that had already started a structure—however, when the other children tried to add to the structure, the first child got upset that her design was changed. The evaluator also observed one adult-child group where the child was the main “builder” and the adult observed and encouraged the child, and occasionally offered advice (e.g., “I don’t think that stick is long enough to reach the others”), and one adult-child group where both worked together (talking about the design, sharing building materials) to build a “windmill” type of structure.

EXPERIMENTATION

An exhibit-specific goal for the Bridge-building Station was to encourage experimentation with building materials. When the station was being used, the evaluator observed many instances of experimentation. For children using the exhibit alone, the evaluator observed signs of experimentation that were simple, including trying different lengths of sticks during the building process, switching out types of connectors (e.g., the stiff wooden circle connectors versus the flexible plastic wheel connectors). Experimentation appeared to be more complex with an adult in the group—for example, changing the features of the structure over the course of the building experience. In one instance, the adult-child pair that worked collaboratively to build the “windmill” structure detached the “windmill” spokes and changed their orientation to horizontal to look more like a helicopter.

KEVA PLANK STATION



EXHIBIT DESCRIPTION

The Keva Plank Station is located on Design Studio side of *Construction Zone*, directly to the right of the main exhibition entrance. This area includes two small tables enclosed by a low wall on one side and a window looking out into a common area on the other side. Below the window, teal bins are full of Keva Planks (small, rectangular wooden planks) that visitors can use to build whatever they choose. Similar to the Bridge-building Station, at some points during the observations, all materials were stored away in the bins and the tabletops were clear, and in other cases, structures and piles of Keva Planks were on tabletops, visible to visitors.

OVERALL EXPERIENCE

Similar to the Bridge-building Station, the Keva Plank Station is one building activity of many on the Design Studio side of the exhibition, and visitors seemed more likely to use the area when some of the building materials were out on the tabletop, or when there was a partially constructed structure started on the tabletop. This is likely because the storage bins along the wall are opaque, and when all the materials are put away, the Keva Planks are not visible to a visitor approaching the area. In a few cases, the evaluator started a structure with the building materials to encourage use of the station. Compared to the Bridge-building Station, the Keva Plank Station was used by more visitors during the observation period, and this may be because it is located closer to the main entrance of the exhibition.

Adults and children (typically age 3 or older) used the Keva Plank Station both alone or in groups (child-child and adult-child). The Keva Planks are intuitive for visitors to use, and visitors quickly begin building a structure as soon as they sit at the table. In some cases, visitors built until they considered their structure to be “done,” until the structure fell down (and in some cases they started to build a new one), or until they lost interest or were called away by someone in their group. In one case, a child chose not to build vertically, but instead to create a design with the Keva Planks lying flat on the table. On several occasions, children enjoyed knocking

down a structure left by a past visitor, and on several occasions children took time to put away all the planks into the bins when they were done at the station, leaving the tables clear.

Visitors' time spent using the Keva Plank Station varied widely. As noted above, if all building materials were put away, visitors were less likely to walk over and start building a structure, but those who stopped at the Keva Plank Station tended to use it for at least one minute. The evaluator observed several visitors (alone or in groups) that used the area for an extended period of time (between five and 15 minutes). One adult sat alone in the Keva Plank Station while his child played at the Lego Station and spent 15 minutes building a tall, complex tower structure with intense focus.



COLLABORATION

Similar to the Bridge-building Station, collaboration varied among those using the Keva Plank Station. A few children and adults used the exhibit by themselves, and a few children used the exhibit together (though primarily working on their structures independently). A few adult-child groups used the exhibit together (again, primarily working independently, or with the adult observing rather than participating), and the adult occasionally offered words of encouragement or praise (e.g., “Bellissima!” or “I like that, it looks like a space ship”). The evaluator observed one instance of an adult and child working collaboratively to build a tower together as tall as possible, talking to each other throughout the process about how to stack and taking turns adding pieces to the tower.

Interestingly, adults seem more likely to use the Keva Plank Station on their own (independent from any children in their group) than the Bridge-building Station or the Excavator Activity. For example, in one adult-child group, the adult and child sat across from each other at the table working on their own structures without talking. After about two minutes, the child left to go to another exhibition, but the adult remained working on her structure for another minute before she left the exhibit to rejoin her child. And, as noted above, one adult used the Keva Plank Station for almost 15 minutes by himself building a tower.

EXPERIMENTATION

An exhibit-specific goal for the Keva Plank Station was to encourage experimentation with building materials. As with the Bridge-Building Station, when the Keva Planks were being used, the evaluator observed many instances of experimentation, such as visitors building a structure up vertically until it fell down, and then trying again (either with the same design more carefully or a new design). Visitors (children in particular) also observed structures left by past visitors or being built by another visitor and tried to imitate design elements or construction techniques they saw (e.g., stacking the planks vertically using the narrow end as the base versus using the long end as the base, creating a spiral structure, or imitating the tall tower (pictured above)).