Science Museum of Minnesota®

MAKING DESIGN PRINCIPLES

Our research supported strategies to building a more inclusive makerspaces

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IF YOU WANT TO DESIGN A DROP-IN MAKERSPACE THAT IS INCLUSIVE TO A VARIETY OF FAMILY NEEDS, YOU SHOULD TRY TO...

Focus on **rich materials**

Acknowledging the role that materials and tools play in making, "rich" materials are widely available, do not require specialized tools for manipulation, and can be used for a variety of functions.

The Benefit
Allows for continued making outside of the makerspace and supports creative engagement.

Include **example pieces**

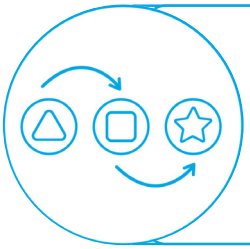
Physical creations seeded in the space that show a variety of skill levels.

The Benefit
Serves as inspiration for what to make and an information source for how to make with particular rich materials.

Include open-ended **activity prompts**

Any sort of museum-provided direction as to what to make, ideally ranging across assembly, creative construction, and tinkering-style prompts.

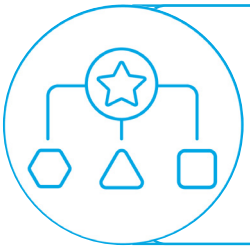
The Benefit
Provides an entry point into making for people who need more structure or guidance in order to get engaged.



Use **icons** to convey information

Using accessible icons in instructions instead of words whenever possible to provide support for visitors.

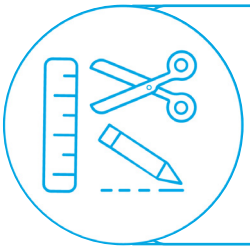
The Benefit
Supports accessibility for visitors who are preliterate or who read languages other than those provided.



Provide opportunities to **contribute to something larger**

Clear opportunities and invitations for visitors to leave something behind as part of a collaborative effort.

The Benefit
Communicates honor and value for visitor-made creations.



Provide **workstations** for making

Provide a full complement of tools, supplementary materials, and seating at each family workstation.

The Benefit
Supports accessibility for visitors with limited mobility and ease of locating tools for making.

If you want to design a drop-in makerspace that is inclusive to a variety of family needs...

FOCUS ON RICH MATERIALS

What is it?

Rich materials refers to the role that materials and tools play in making. Specifically, we consider a material "rich" if it has the following characteristics:

1. Widely available, which allows for continued making outside of the makerspace
2. Does not require specialized tools for manipulation, which again allows for continued making outside of the makerspace
3. Can be used for a variety of functions, which supports creativity

Our makerspace always centered cardboard because it was identified as part of existing BIPOC family making practice in the Making Connections project, but the theme of rich materials could be extended to any material that provides relatively easy on-ramps to making yet also supports highly sophisticated practice.

Why is it important to visitors?

Familiarity — both with materials and tools — shaped how families engaged in this makerspace. Based on survey data collected at the 2021 makerspace events, the majority of makerspace visitors already enjoyed making in their everyday lives, and 25% reported having personally made something out of cardboard in the prior year. During making, we saw some evidence that visitors were more familiar with tools such as the scissors and roller for perforation — which looked like a "pizza cutter" — including use of these tools independently (without need for staff demonstration) and earlier in their making process. Unfamiliar tools such as the klever cutter (safety box cutter) needed some onboarding by staff, but were adopted rapidly, proficiency easily achieved. Finally, visitors who engaged in a follow-up interview offered stories of how their families continued to make with cardboard after the makerspace experience, including creating a cardboard "slide" from a bunk bed.

What does it look like in practice?

In practice, providing rich materials involved storage of copious amounts of materials and some figuring out of specific materials. For example, we found that with new cardboard, a particular cardboard heaviness — E-flute with light substrate — worked best for minimal tool manipulation, and we needed 39 miles worth of tape for a three-month makerspace.

Material storage room in 2021

Creative Use of Tape

Tape is a central feature of the cardboard makerspace. Originally selected for its use holding cardboard together, tape has proven to be another rich material with visitors innovating new creative uses for it in their making. While the first 2015 makerspace iteration only included blue painters tape, the 2016 makerspace introduced tape of multiple colors. Early in the three-month run, a museum staff member wrote “Be Creative” with tape on a black makerspace wall, and thus, Tape Graffiti was born! In 2021, the makerspace was held in a sunlit room. Instead of Tape Graffiti, visitors spontaneously created a Tape Stained Glass area, using tape’s translucent quality as a new affordance.

This visitor used tape’s sticky quality to give their graffiti a 3D quality.

Visitors used the tape’s translucent quality for artful making.

How does it relate to theory?

A makerspace is fundamentally shaped by the materials and tools housed within. Specifically, materials shape making in three ways: existing relationship or familiarity, overall physical affordances and constraints, and the in-the-moment process of becoming. First, people live in a material world and may enter the makerspace having already experienced a material, including for making purposes. As noted earlier, our choice of cardboard as the primary material was based on existing familiarity; participants in the Making Connections study explicitly named cardboard as a material they used for making (Bequette et al., 2018). Second, affordances and constraints can be understood as what is easy or difficult to do because of the physical properties of a material.

For example, the filament used in 3D printing (PLA) melts at 180° Celsius or 356° Fahrenheit, which is an affordance. However, in order to perform the additive fabrication style of 3D printing, the maker needs to have a small amount of the filament reach that temperature at a particular time, which is a constraint. While all materials have affordances and constraints, we emphasize minimizing the constraint of specialized tools for manipulation because that constraint holds greater threat of limiting at-home making. Finally, making is a process of becoming for both the person-becoming-maker and the material-becoming-creation. Posthuman perspectives highlight that human and materials are enmeshed in complex intra-action (Barab, 2003); when making, people leave their imprints on materials, and materials make imprints back. A posthuman perspective on rich materials would focus on how a maker comes to know and create with a particular material and how that material contributes to the making process.

How have SMM's thoughts changed over time?

> *It's like an imagination vessel, and environment for creation. You don't need many materials for an imagination vessel. The box can be a car. It can be a plane. It can be a rocket. It can be a house. It is everywhere and it can be anything. (Goeke & Braafaldt, 2019; internal report)*

Our choice of which cardboard to provide has evolved. The early makerspace iterations focused on cardboard boxes to evoke connections to at-home making, that children often spontaneously engage with cardboard as an imaginative material. In earlier iterations, cardboard was always supplied in box form to support those connections. Relying on donated cardboard reduced the overall cost of the makerspace, but typically required a prolonged period of collection and storage ahead of the exhibition. In 2021, we shifted to providing primarily "clean" cardboard sheets, meaning new cardboard donated through a sponsorship. This decision was made for two reasons: 1) as the makerspace was opening during the COVID-19 pandemic, "new" cardboard was potentially more comfortable for visitors, and 2) we wanted our visitors to see the experience we provided as high quality, not as providing cast-off materials. We have not seen a change in engagement based on the form of cardboard; the material itself is rich, not how it looks.

Additionally, materials are supported by tools, and in the Cardboard makerspace, we provide a large number of a select set of tools to support cardboard making. In the initial iterations, these included safety scissors, cardboard saws, and masking tape. By the 2018 iteration, we had settled on safety scissors, safety klever cutters, and tape in a variety of colors as the core tools. In 2021, we added pencils, rulers, and a roller for perforation to the toolbox (see Workstations section below for greater detail).

If you want to design a drop-in makerspace that is inclusive to a variety of family needs...

INCLUDE EXAMPLE PIECES

What is it?

Example pieces are physical creations seeded in the space. Ideally, example pieces will show a variety of skill levels, such that visitors can see the "floor" and "ceiling" of possible creation with a material. Example pieces may be created by museum staff or visitors.

Why is it important to visitors?

When visitors enter the cardboard-focused makerspace, we have anecdotally noted that visitors will explore the space and existing creations before settling into making themselves. These examples serve as direct inspiration for what to create. For example, adults sometimes direct children to look at examples to spark making ideas or families will first play with existing creations before making their own version (Lukowski et al., 2023). Example pieces are also used to understand how to make something. For example, our shadow puppet theater activity did not include instructions for how to make puppet, but pre-built examples available in the theater demonstrated the critical construction techniques.

What does it look like in practice?

2021: Hanging example made by staff

2021: Cityscape tables held staff and visitor-made examples

2018: Artist-in-residence

2021: Wall-mounted example piece, made by staff with a visitor-added bee

Parallel Making of Guitars
We encouraged staff to create example pieces while working in the makerspace both to seed complex examples and to generate embodied experiences of cardboard creation. When talking about facilitation of the space, one of our core staff facilitators, Jonah, shared the story of creating a guitar while working in the makerspace. While he made it, young visitors would come up and ask if he would make a guitar for them. Jonah would say, “No, but you can make your own.” This story — creation becoming inspiration becoming a new creation — is exactly the process example pieces are intended to serve.

How does it relate to theory?

Example creations reveal the complexity of how to make with a material and serve as inspiration pieces for what to make. In maker education where persistence through failure is a central value (Dougherty, 2013; Martin, 2015), designers need to actively decide where there is more meaningful and less meaningful struggle for learners in order to manage levels of frustration (Anderson et al, 2019). Example pieces address two core sources of frustration in making: deciding what to make (Sawyer, 2017) and understanding how to make. Any example piece, from a helicopter created by an artist to a robot created by a preschooler, can provide the spark of inspiration for a new helicopter, robot, or maybe a combined flying robot. Including highly complex creations where learners can look closely at how a more expert maker created an object alleviates some questions about how to make. In both cases, educators may be concerned that learners are “just copying” examples. However, learning in a makerspace is all about participating in construction. Even if a learner is creating another robot, their robot is unique and they have to figure out how to construct something that meets their vision (Keller & Keller, 1996). Even if a learner is replicating a technique used in an example, they have to fit that technique into their own plan. The inspiration and know-how supplied by example pieces are building blocks supplementing making, not overtaking making.

How have SMM’s thoughts changed over time?

While visitors had left behind example creations in early iteration, 2018 was the first intentional introduction of examples in the form of artists-in-residence, a creation display area, and a techniques board. The artists-in-residence program highlighted complex cardboard making, while the creation display area honored the making of museum visitors. The techniques board supported initial making.

In 2021, as we shifted to a themed makerspace (see the Contribution to Something Larger section for further detail), we shifted to premade example pieces. Example pieces included high sophistication items installed out of reach of visitors, such as a whale and city arch, and seed creations interspersed with visitor creations, such as Spider-Man on a construction crane or wearable hats. The example pieces were created by SMM fabrication and facilitation staff who eventually worked in the makerspace with the public, supporting staff buy-in around the makerspace.

If you want to design a drop-in makerspace that is inclusive to a variety of family needs...

INCLUDE OPEN-ENDED ACTIVITY PROMPTS

What is it?

Activity prompts are any kind of guided direction on what to make. They may be highly specific or more open-ended. Open-ended activity prompts are a powerful tool for balancing novice-maker's need for direction and expert-maker's desire for open creativity.

For example, consider two prompts for a car-making activity. A more specific prompt may read "make a car that travels down the ramp at exactly 1 mile per hour." In this case, item, setting, and success conditions are predetermined and presented in the prompt. Alternatively, the prompt may read "make a car that works on many terrains" (this prompt was actually used in in our Cardboard City makerspace). In this case, the item is predetermined but the maker gets to determine what terrains or settings to consider and how to define the success condition.

Why is it important to visitors?

Activity prompts give direction for what to do in the makerspace. Our makerspace included a range of making activities — from completely undirected making, lightly prompted creation of a cardboard city, wearable and theater stations where examples showed specialized construction techniques, and a Gravity Racer activity with step-by-step instructions for vehicle assembly. The variety of activities created multiple entry points for engagement so that families with different preferences and comfort with making could locate an activity suited for their needs. Importantly, because activity prompts were phrased in an open-ended way, there were no "wrong" forms of engagement; creations such as political flags and dinosaur models were not intended by the designers of the makerspace, but they were embraced by visitors.

The Gravity Racer activity was undoubtedly the most popular activity in the Cardboard City makerspace. Physically, it involved pre-cut wheels of multiple sizes, an icon based graphic, square cardboard sheets to cut the car body from, and a ramp to test creations. In surveys and interviews with families who experienced the makerspace before Gravity Racer was installed, families with young children (ages 4-7) and families with less comfort or enjoyment in making talked about needing more direction. The families who returned and experienced the Gravity Racer activity described it as providing that needed direction. The provision of any type of intentional prompt in this makerspace was new for the museum, and we are continuing to explore how to balance providing direction and encouraging creativity. We are not advocating that all activities fall into assembly-style making, but having at least one assembly-style activity provides an entry point for those less comfortable with making practices.

What does it look like in practice?

Below are prompts created for three activities in the Cardboard City makerspace showing how the same base activity can be evoked with assembly, creative construction, or tinkering style prompts.

Wearables

Creative construction prompt

A hat that fits your mood

Make a hat for a special occasion or just for fun. Try it on and model it on the runway.

How does it look? How does it fit?

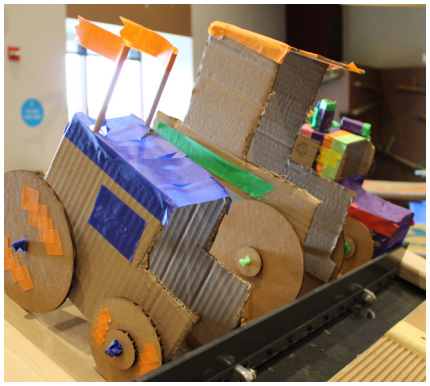
Does it stay on your head if you jump up and down?

Tinkering prompt

Inviting imagination

This is where ideas can come to life, from one-of-a-kind fashion items toworld-changing machines. What will you make?

Gravity Racer



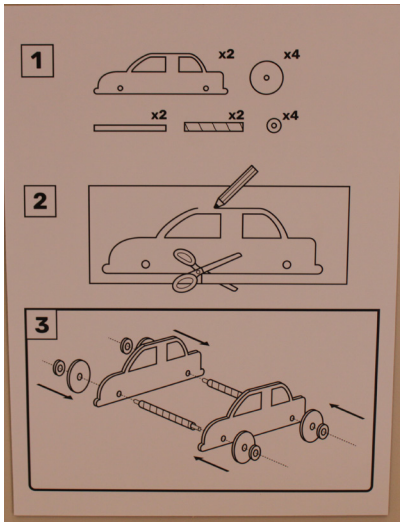
Creative construction prompt

This city is known for rough roads and steep slopes.

Build a vehicle that can safely reach the bottom on any road condition.

Assembly prompt

A graphic shared assembly-style instructions



Creative Cars

Providing an open-ended prompt does not limit creativity. With the Gravity Racer activity, we observed visitor-generated goals concerning the speed of the car (i.e. make the car go faster than other cars) that contrasted the written prompt concerning "safe" descent. Second, while the icon-based instructions showed a single style of car, visitors widely expanded upon this form, as can be seen in the examples below. Providing a prompt does not restrain creativity as long as materials can be used in many ways.

How does it relate to theory?

It does not take large conceptual leaps to understand that different types of making require different skills and produce different learning. Bronwyn Bevan (2017) talks about educational making as a trajectory of skill development with STEM making activities falling into one of three categories: assembly, creative construction, and tinkering.

Assembly-style making is characterized by a preset design goal and construction steps, often looking like off-the-shelf kits with step-by-step instructions. Close-ended, assembly style making supports skill development and building material fluency. Creative construction is characterized by a general preset goal but opportunities for creative agency. Creative construction making supports skill development related to the predetermined elements and development of problem solving and creativity skills. Finally, tinkering style making is entirely open-ended, with the maker determining their own goal and requiring creative and skillful use of materials to achieve it. Tinkering is prioritized in educational making, but it relies on skills developed via assembly and creative construction style making to prevent complete frustration. Recognizing that a museum makerspace needs to engage both novice-makers and expert-makers, activity prompts across the makerspace should hit on each of the three categories.

How have SMM's thoughts changed over time?

While earlier makerspaces at SMM emphasized open-ended creation, including a variety of activity prompts provides multiple entry points for families with different needs. Until 2021, no explicit prompts were supplied in the makerspace. At times, a volunteer-led activity was available in the space, but nothing in the makerspace design directed visitors on what to make. The addition of light activity prompts was directly intended to support visitors who may have less existing practice in making and/or are unsure where to start in the space. The activity prompts were based in five activity areas: shadow puppet theater, ball run, wearables, Gravity Racers, and city skyline buildings. These activities can be seen as generally supporting one of Bevan's (2017) three types of maker activities: Gravity Racer is assembly, puppet theater and wearables are creative construction, and ball run and city skyline buildings are tinkering. Each prompt involved light narrative connecting it to the city theme and opportunities for engineering challenges (i.e. "safely reach the bottom" or "stay on your head").

If you want to design a drop-in makerspace that is inclusive to a variety of family needs...

USE ICONS TO CONVEY INFORMATION

What is it?

Icon-based labels refers to the intentional use of static images to convey information instead of written text.

Why is it important to visitors?

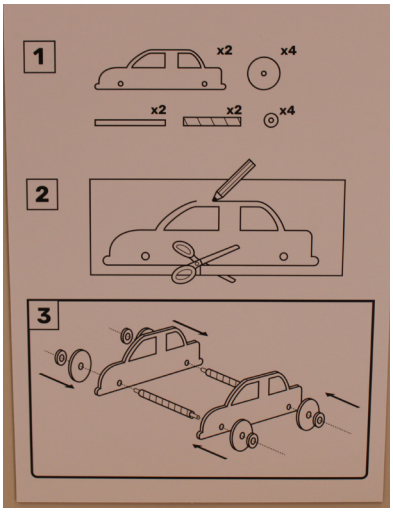
With the activity prompts, icon-based graphics for instruction are more accessible for preliterate visitors, visitors who read a language other than those provided, and visitors who are uninterested in reading signs (sign fatigue). Additionally, icon-based graphics may be advantageous for demonstrating actions. In the Gravity Racer activity, we provided basic step-by-step instruction through icons. In video data with this activity, we specifically saw children using the icon-based label as a reference point for engaging in making and conversation with adults. In future iterations, we are considering how icons can be used to communicate more ideas — such as how to use less familiar tools like the safety klever cutter and roller for perforation — for supportive on-ramps for making.

What does it look like in practice?

2018: Joinery technique board

2018: Decorative technique board

2021: Joinery technique board



2021: Icon-based assembly instructions

Wheels on the Car

Icon-based labels can be used by preliterate children to participate in family making in ways not necessarily possible if information is only conveyed via text. One Family Engagement Partner visiting the 2021 makerspace recorded their interactions while gathering materials to make a car. While the adult in this group is listing out the materials to collect, she directly points at the icon-based label. Her 5-year-old daughter notices that the adult miscounted the number of necessary wheels, pointing again at the icon-based label. While this moment is not momentous, the icon-based label usage supported the mother and daughter's joint participation in the act of gathering materials.

How does it relate to theory?

The benefit of pairing imagery with text for learning is well documented. Here are a few research findings noted in Connie Malamed's (2015) book on using visual design in learning contexts:

- The pairing of text with relevant visuals produces better learning than text alone
- Visuals capture and hold attention longer than text alone

Turning to visuals without extensive text, major companies such as IKEA® and LEGO® both use icon-focused instructions to convey how to build their complex products (Pavlus, 2015). Generally, information is conveyed best when cognitive load — or the amount of work someone has to do to understand — is reduced. This reduction is facilitated by reducing extra material and redundancy, highlighting essential features, and increasing contiguity across representations (Mayer, 2008).

When investigating how to convey human/motor manipulation — such as knot tying or origami — specifically, the research evidence is somewhat mixed in terms of best practices. Preservation of movement is critical, either through display in a dynamic visualization (i.e. video clip; Wong et al., 2009; Lee & Shin, 2012) or through display of movement icons (Michas & Berry, 2000).

How have SMM's thoughts changed over time?

As a museum, pairing images with text is common practice (Piehl, 2020). Signs identifying available tools included images of those tools in the early makerspace iterations (2015 and 2016). However, the joinery techniques board developed for the 2018 makerspace iteration was the first attempt in this development trajectory to convey information about how to make through images alone, no paired text to repeat the information. The joinery techniques board included a title for the technique, such as "slot," and a physical representation. When the technique required two actions, such as cutting slots in two cardboard pieces and then wedging them together, two physical representations were connected with mathematical symbols, such as plus or equals signs. In 2021, the use of icons was taken to a new level, with arrows indicating assembly processes.

If you want to design a drop-in makerspace that is inclusive to a variety of family needs...

PROVIDE OPPORTUNITIES TO CONTRIBUTE TO SOMETHING LARGER

What is it?

Opportunities to contribute to something larger may look like areas to leave creations as examples or to collaborate on larger structures. These designated areas convey a sense of honor and elevation of visitor-created pieces, and are distinct from making workstations.

Why is it important to visitors?

Visitors spend considerable time in museum makerspaces, and this investment is enhanced when visitors feel that creations they leave at the museum continue to be honored and valued. Earlier iterations were harder on museum staff members, in part because they witnessed visitors pour labor into a creation and leave it for others to enjoy, only for another visitor to remix the creation. The initial display area (2018) provided an opportunity for staff who observed visitors spending extra care on their creations to select and reward those works. After seeing the display, many visitors wanted to add their items. Thus, we adjusted practice so that any creation could be placed on display. We heard the value of the change during our 2018 Member Study, when members in focus groups talked about Cardboard Engineering being a highlight experience at the museum because of the chance to contribute to something larger. In 2021, the opportunities to contribute to something larger were focused on leaving example pieces at each of the activity zones, with contribution to the collective “City Skyline” being a focal opportunity.

What does it look like in practice?

2018: Creation display area

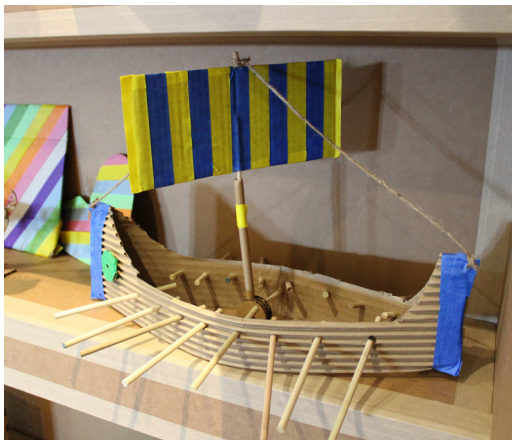
2021: City skylines

2021: Welcome graphic

Staff Curation in Cardboard City

The Cardboard City exhibition had multiple areas where visitor creations could be honored and become part of the growing, collective space. These included cityscape tables where visitors could leave their creations to be part of the city, a 'garage' shelf near the Gravity Racer ramp where cars were left behind, and a set of shelves near the entrance that highlighted visitor creations.

Staff were crucial in curating these spaces, selectively recycling some creations and keeping others at the end of each day. While this practice generated example pieces for future visitors, it also prevented us from being overrun with creations across the 3-month exhibition run.



How does it relate to theory?

In educational making, process is more important than product (Honey & Kanter, 2013). In reality, any creation left behind in a drop-in makerspace is disposed of, either through remixing or waste. However, people feel strongly about items they create. The "IKEA effect" is a psychological phenomenon where people value items they have poured labor into over identical items made by another (Norton et al., 2012). The IKEA effect has been documented in children as early as 5 years old (Marsh et al., 2018). Additionally, it is not moderated by effort. A person can put a low amount of effort into creating something and still value it more than an identical item they did not create (Marsh et al., 2018). Recognizing the IKEA effect produced in a makerspace, having the disposal of a high effort creation being front and center can create negative feelings. Opportunities to contribute to something larger physically elevates visitor creations in a similar way to their personal elevation of it, even if that display is temporary and the item will ultimately be disposed of as well.

How have SMM's thoughts changed over time?

In 2015, the collective project involved large fort building, while later iterations emphasized remixing existing projects (2016), tape graffiti (2016), and inclusion in the creation display area (2018). In the museum's 2018 Member Study, members named the cardboard makerspaces as a highlight of their multiple museum visits, specifically because it prompted contribution to a larger or ongoing creation. The 2021 makerspace built on this insight with the introduction of a theme. For example, Cardboard City included city skyline display tables where visitors could leave their building. Additional themes such as "space" were explored for future iterations. The photowall used in Cardboard City (2021) also supported the sense of contributing to something larger for visitors who chose to take their creation home.

If you want to design a drop-in makerspace that is inclusive to a variety of family needs...

PROVIDE WORKSTATIONS FOR MAKING

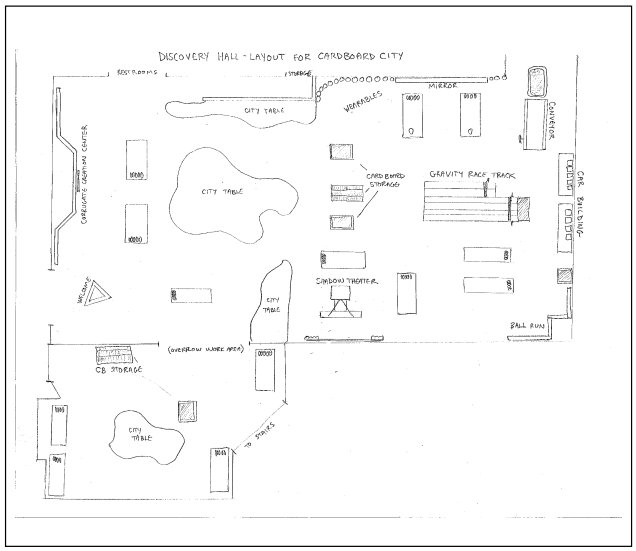
What is it?

Workstations refers to a designated area for making that includes all the necessary tools, a work surface, and seating.

Why is it important to visitors?

Creating multiple tabletop workstations with materials and space for making is superior to centrally located materials and distributed making locations. Creating workstations was a "happy accident" brought on by the COVID-19 pandemic, but comparing the experiences in the 2018 makerspace where materials and tools were centrally located to the 2021 makerspace where materials and tools were distributed at workstations, the latter created numerous benefits. First, workstations raised making off of the ground, which had important accessibility benefits. Adults with limited mobility were no longer required to sit on the ground to collaboratively make with their family, and the walkways remained clear for visitors using wheelchairs or strollers. Second, staff could easily identify when a family completed making and left the makerspace, prompting them to "reset" the workstation for the next family. Similarly, staff were no longer required to stoop to the ground over and over again when cleaning the space. Finally, having tools at the workstation aided locating and returning tools. In previous iterations, tools would be lost underneath creations and families would hold onto tools they were not actively using, creating artificial tool shortages. These issues disappeared with the workstation system.

What does it look like in practice?



2021: Sketch of Layout for Cardboard City, the rectangle tables are workstations

2021: Workstations in cardboard City

Learning to Cut

As an unfamiliar tool in the makerspace, learners needed some instruction to understand how to operate safety box cutters, called Klever cutters. In the two images below, we see two different attempts at using the klever cutter. In the first image, a child attempts to use the klever cutter, spontaneously figuring out its use but ultimately abandoning the tool. In the second image, a child of similar age is shown how to use the tool and ultimately goes on to use the klever cutter through his making. We call out this contrast to make clear the role of familiarity in tool selection and that even easy-to-manipulate tools and materials may require some orientation to get makers started. Development of this tool fluency appeared to happen faster with teenagers.

Image 1: This visitor spontaneously figures out how to use the safety klever cutter.

Image 2: This visitor is shown by a staff member how to use the safety klever cutter.

How does it relate to theory?

Workstations support the ergonomics of two groups: visitor family groups and museum staff. Task Analysis — a description of the totality of demands imposed on a worker in a given job — is a methodological tool for understanding how a job is demanding (Landau et al., 1998). Actions such as frequent stooping to the ground or sitting without a chair are considered higher strain and thus greater demand. Additionally, walking compared to sitting is considered higher strain, causing fatigue. Having a workstation reduces excess strain for both the task of making and task of facilitating/cleaning.

How have SMM's thoughts changed over time?

Our cardboard iterations between 2015 and 2018 utilized a Cardboard Corral, with cardboard boxes available in a single location. Tools were also centrally located at a few tables scattered throughout the space or held by staff for distribution. Families would retrieve their cardboard material and tools, then find a place on the floor for intensive creation. This system meant making was distributed across the space and sometimes resulted in limited tool supply. Additionally, the cleanup required of the staff was physically strenuous, involving stooping down to the floor to retrieve cardboard scraps.

In 2021, the iteration implemented a workstation system. The space's designers distributed fifteen workstations across the makerspace, stocked with multiple tools and colored tape. Cardboard material was available throughout the makerspace in smaller cardboard supply stations. The workstation was intended to allow family members of different skill levels to work together on independent or collective projects and ease logistical challenges for staff cleaning up. Staff members reported that the workstations made it easier to keep the space clean because they could see when a family was done making and had left the space. Instead of the entire makerspace needing monitoring and maintenance, the staff "reset" workstations when needed, resulting in the sense that cleaning was a smaller part of their overall duties.