What You Bring With You, and What You Take Away

Strategies for Supporting Creativity and Making Meaning in Immersive Exhibitions

Jessica Neuwirth, Hillel O'Leary

HILLEL O LEARY

Fig. 1. Installation view of the Creativity Immersive Gallery exhibition, inflatable by Pneuhaus.

Jessica Neuwirth is Director of Engagement and Interpretation at the Amesbury Carriage Museum/ Industrial History Center in Amesbury, Massachusetts. Previously, she was the Exhibition Developer at the Providence Children's Museum in Providence, Rhode Island.
jessica.neuwirth@gmail.com

Hillel O'Leary is an Assistant Professor in Industrial Design at the Rhode Island School of Design in Providence, Rhode Island. O'Leary was formerly the Exhibit Designer and Design Manager at the Providence Children's Museum.
hilleloleary@gmail.com

In 2017, Providence Children's Museum (PCM) launched the Creativity Initiative to address the creativity crisis – the gap in opportunities for developing crucial skills that come from creative practice among kids in the United States.[1] The three-year project, created to connect all children to Rhode Island's creative community, included a series of temporary immersive exhibits developed in collaboration with local artists to showcase creativity in physical form. Research into methods of supporting creativity suggested that the kinds of immersive, open-ended, self-directed, multisensory, active experiences we hoped to create would enable children to practice creative skills in an environment supportive of experimentation.[2] In this article, we'll explore our research into using exhibitions to support the skills that are built while being creative – in particular, our use of open-ended, immersive installations to support creativity (fig. 1) – as well as our experiments and learnings in developing them.

Background on the Creativity Crisis

Educators and policy makers in the United States have been exploring the kinds of skills and education necessary to thrive in increasingly complex and changing social and economic environments that characterize the present. Research has shown that creativity, linked with imagination, is important for children and adults in the 21st century. Imagination and creativity can be thought of on a continuum from *imagination* (to wonder what if) to *creativity* (imagination put into action) to *innovation* (when creativity can be applied in the real world to solve problems or advance knowledge), and thus have a role in real-world problem solving. Creativity is also important for the many skills developed while being creative, such as problem solving, collaboration, flexible thinking, persistence, tolerance of ambiguity, perspective taking, self-expression, and self-reflection.[3]

Beginning in the 2000s, educators began to raise concerns about a creativity crisis among U.S. children, a situation first identified by Dr. Kyung Hee Kim, a professor of education at the College of William and Mary in Williamsburg, Virginia. For a research study she began in 2008, Kim reviewed the results of a variety of tests for creativity administered across the United States to children and adults since the 1960s. She found that scores began to decline in 1990, reaching a low in 2008. In a follow-up review in 2017, Kim found the decline in scores to be even greater, especially among kids ages five through 10. Researchers point to a variety of factors in this decline, including the pressure for testing in public schools that focuses time on conventional answer test taking and rote learning;[4] the subsequent decrease in time spent on arts

instruction; and a decrease in time spent in the kind of free play that provides an outlet for creative development missing from schooling.[5]

Initial Research

In the years since Kyung Hee Kim identified the creativity crisis, education-based organizations (such as after-school programs and museums) have tackled the issue, most often by providing opportunities to be creative: to paint, sing, and dance. Research by early childhood educators indicates that "creativity is strongly influenced by environmental factors such as explicit instructions, positive process-oriented feedback from important adults (e.g., teachers and parents), and active involvement in novel experiences. This contradicts the widely held notion that creativity is an inborn and elusive talent."[6] Indeed, it is possible to train people to be open, active, exploratory, flexible, unique problem solvers – that is, to be creative.[7] The PCM exhibits team wanted to find a way to support creativity through carefully designed exhibitions – novel experiences – using the open-ended, self-directed exploration that often occurs in the informal environments that PCM develops.[8]

Our interdisciplinary exhibitions team, comprised of artists, designers, historians, early childhood educators, and scientists, found inspiration in the work of philosopher Maxine Greene, who argued for the transformative power of aesthetic experiences that can move people from their commonplace lives into awareness, "wide-awakeness," and even to change.

These beliefs about the power of art informed Greene's work in developing the practice of aesthetic education. From 1976 until 2012, Greene was the Philosopher in Residence at the Lincoln Center Institute in New York City, the education arm of the Lincoln Center for the Performing Arts, which sought to bring access to the arts and improvements to education through deep engagement with the arts. There Greene championed an education that provided active engagement with art works from which "students develop an inside understanding of the artistic choices that contribute to the creation of a work of art and activate their own imaginations. As a result, unexpected connections are made within their daily lives... and doors to new and imagined worlds are opened."[9]

We wondered if we could help visitors to Providence Children's Museum to engage with art and activate their imaginations, opening the possibility of new understanding. We wondered if unique opportunities to unlock imagination would be a key to practicing capacities that underlie

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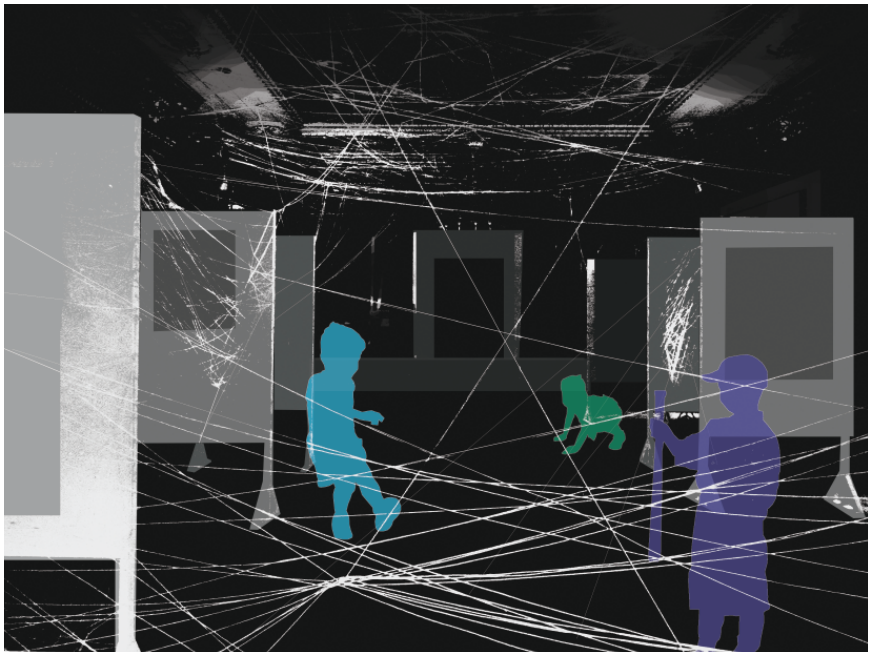
creativity, such as flexible thinking, problem solving, self-reflection and self-expression.

The work of 18th-century Irish philosopher Edmund Burke added another dimension to our thinking about the power of art to inspire creativity. Burke suggests that the experience of the sublime – that moment of transcendent connection to something strange and beautiful that evokes an overwhelming emotional and physical response in the body – is a powerful force that can shift perceptions and understandings of the world. Could experiences of the sublime in artistic production be an effective tool in sparking imagination in visitors to PCM?[10]

Fig. 2. Artist rendering of Duchamp's *His Twine* installation.



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We believed that the work of Greene and Burke provided an interesting roadmap; we wanted visitors to have deep and meaningful engagement with art as a way to build the capacity for imagination and creativity. But we also had a crucial question. How might aesthetic education – involving teachers, classrooms, and sustained, directed engagement with art – translate to the informal, self-directed environment of exhibitions?

Installation Art

Our ongoing research suggested that immersive installation art – as developed in the mid-20th century – could be an answer. Immersive installation art, defined as multisensory experiences that fully engross the participant as active player, not observer, can be novel, aesthetic encounters, whereby visitors explore another's perspective in three dimensions, while also navigating in their own time, for their own purposes. We felt it was of particular importance that these experiences provided opportunities for children and adults to create meaning through *embodied interaction*, wherein the meaning of the exhibition is co-created by the audience as they interact with the features of the exhibition. Inside an installation, it might not matter if a child *knew* they were experiencing art; through their exploration they would have an aesthetic experience nonetheless.[11]

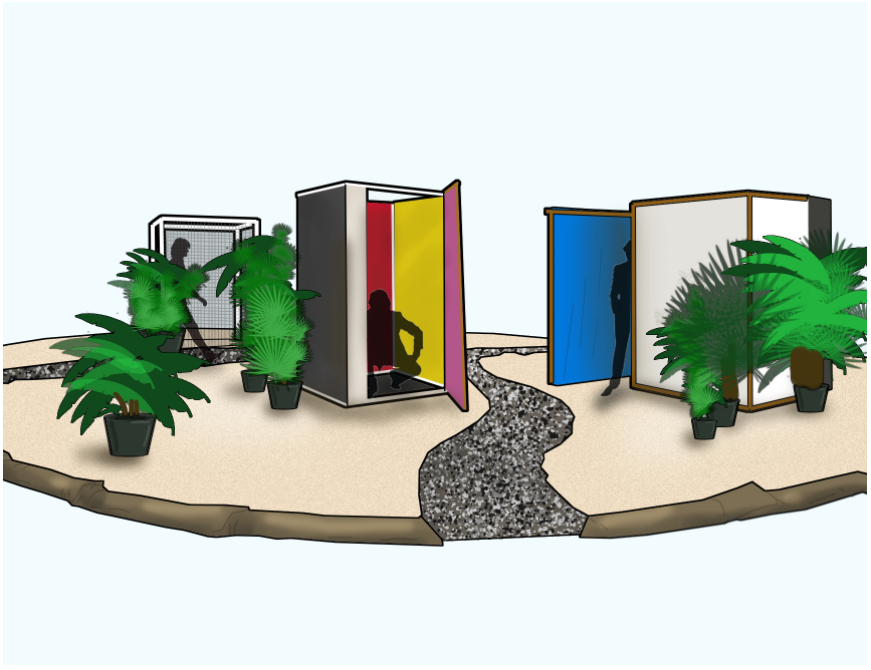

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Fig. 3. Artist rendering of Oiticica's *Tropicália*.

Two historic installation works provided inspiration for thinking about how experiential art could provide novel aesthetic experiences activated by visitors: French-American Surrealist artist Marcel Duchamp's foundational installation, *His Twine*,[12] and Brazilian artist Hélio Oiticica's *Tropicália*.

Duchamp's 1942 installation at the Whitelaw Reid Mansion in midtown Manhattan was, in fact, designed with children in mind (fig. 2).[13] The audience navigated an ornate ballroom filled with an expansive web connecting and obscuring surrealist works of the French Avant-Garde, while children in sports costumes darted back and forth between strands of string, playing hopscotch and other yard games in an all-encompassing, multisensory spectacle that confronted viewers with an unexpected *experience* of the surreal. We believe that through this experience, Duchamp intended for his audience to use their actions – and observe the actions of others, in order to figure out his meaning.

Oiticica's *Tropicália* was a series of multisensory installations exploring leisure as an act of reclamation of self and personal time in opposition to dominating political structures (fig. 3). Oiticica coined the term *Tropicália*, which came to refer to a larger creative movement that originated in 1960s Brazil as both a celebration of the culture of the people and a form of opposition to the then repressive government. These installations, first exhibited in Rio de Janeiro, consisted of a series of multicolored rectangular booths installed on beds of sand, surrounded by tropical vegetation. Visitors were invited to interact directly by removing their shoes, feeling warm sand on their feet, sipping orange juice, or moving their bodies, activating *parangolés* – colorful and captivating textiles. Embodied interaction (using one's whole body to interact with an idea or phenomenon, in this case understanding more about rhythm, motion, and one's physical presence through interactions between textile, the body, and the air) was the primary means of inhabiting Oiticica's ideas and gave the experience its meaning.[14]

Concurrent with our research into art and immersion, we explored research on creativity in adults and children. The work of psychologist Teresa Amabile encouraged us to think about the importance of intrinsic motivation in supporting creativity, since coercion and extrinsic motivators, such as the promise of a good grade, can have a chilling effect on creativity. Self-direction and self-determination are key factors in the kinds of explorations that lead to original thinking and novel problem solving.[15] Research into imaginary play conducted by psychologists and researchers of early childhood development Jerome Singer and Dorothy Singer and psychologist Michele Root-Bernstein strongly suggested that children have the greatest scope for expressing and practicing original thinking (a key component of creativity) during pretend play and world building.[16] The CREATE Framework, developed by the Center for Childhood Creativity at the Bay Area Discovery Museum in Sausalito, California, also provided important support for our developing ideas about the necessary design criteria for the Creativity Initiative. Specifically, they cite the following as key components of a supportive environment: being child-centered, risk friendly, exploratory, active, and providing time for imaginative

exploration.[17] These criteria lined up well with our research into the role that artistic, immersive installations could play in supporting creativity.

Indeed, all of our research seemed to converge on developing exhibitions based on both the principle of spectacle and open-ended interaction as tools to open up creative possibilities for our visitors, and provided us with the initial confirmation that we needed to test these ideas in real life. Merging aesthetic education, installation art, and our belief in the power of free play, we saw great potential in utilizing the following design criteria. All experiences should:

- offer a balance of framed and open-ended explorations that provide scaffolding for people of all ages to engage;
- offer a consistent and cohesive aesthetic experience that provides inspiration;
- function through visitors acting and interacting with each other and the exhibition;
- encourage embodied multisensory exploration;
- foster self-directed, self-motivated play, allowing people to follow their own interests;
- provide developmentally meaningful challenges;
- provide adequate time and space to properly explore;
- expose participants to novel and unusual materials and activities; and
- use the ordinary in extraordinary ways.[18]

Summer of Prototyping and Learning

Following our research phase, the exhibits team went into an intensive period of concept development and design for components and immersive installations that would meet the design criteria we'd developed. The PCM exhibits team utilized a rigorous collaborative design process – between developers and designers and with our audience. We committed to a year for the process and a $20,000 budget for this prototyping phase of work. Initially, we used low-fidelity prototyping with paper and cardboard, engaging visitors and staff in quick user-testing. We also designed and built a moveable wall system that allowed us to configure our large public assembly space into smaller pop-up rooms for use with temporary visitor testing.[19]

Then, during the summer of 2018, PCM exhibits staff spent eight weeks formally prototyping the most promising of the exhibit

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components and installation concepts with visitors. Using the temporary wall system and sturdy materials, every Monday we installed a new set of high-fidelity prototype exhibits (modified nightly based on feedback) in our Assembly Space – PCM's large, multipurpose meeting and programming space, making the prototyping space part of the regular visitor experience. Signage indicated that we were asking for visitor help and feedback in creating new exhibits and that staff were present in the space observing visitors. We advertised the fact that we were seeking visitor input and that we would have new, rotating exhibits over an eight-week period. In the course of the summer, we built a following of visitors who came to each iteration.

Our goals for the summer of prototyping were twofold. We wanted to test visitor interest and engagement with the design criteria we had established; we also wanted to provide opportunities for visitors to explore their creative capacities. The pop-up exhibits tested out many concepts and took many forms, including, for example, fort building with unusual/novel materials developed by our in-house artist/designers at a scale not possible at home; building with giant coroplast hexagons of many colors (also designed in-house); inhabiting a noodle forest with a nighttime, silver-lined alien world (complete with glowing alien camp fire); using light, reflection, and mirrored multicolored magnetic shapes to create changing mosaics; and playing and drawing with tape across walls and floors in an otherwise bare, 10-foot by 10-foot space.

Working with our staff evaluator, we devised a program of gathering feedback from floor staff involved with the prototyping through weekly surveys, focus groups, and journals. All exhibit staff had shifts in the prototyping space, along with PCM's regular floor staff. We also undertook caregiver interviews and created talk-back boards to capture top-of-mind visitor feedback. Staff observations, along with the work of the PCM evaluator, gave us rich and varied perspectives on what our visitors were up to in the prototyping space. This collaboration became the model we used to assess all subsequent exhibitions developed for the Creativity Initiative.

As we sifted through the information, we gained insight into our visitors' actions. We witnessed children (and their adults) problem solving, thinking flexibly, collaborating, reflecting and expressing themselves. We also came to see that kids and grownups used their imagination and creative practice in world-building – creating rich experiences of their own design in collaboration with the properties of the immersive exhibitions. This led them to meaning-making: making sense of their experiences and connecting those to their own lives. There were many moments that provided examples of creative capacities practiced and personal meaning-making achieved. The following two stood out, providing us with reassurance that we were on the right track.

Party in the Elevator!

One of our earliest pop-up prototypes during the summer of prototyping was a small, four-foot by four-foot booth constructed from modular walls entirely covered with silver reflective mylar, built within a larger room filled with corrugated plastic building materials and a range of other materials – all focused on exploring the idea of extraordinary encounters with ordinary materials and unexpected interventions. A group of kids swarmed into the small, reflective space. They commandeered an empty kid's swimming pool and pool noodles that we had placed in the space and immersed themselves in the pool, declaring this moment to be the "party in the elevator," which they gleefully and loudly chanted. We saw in this their ability to synthesize the provided parts into an abstract interpretation of a magical elevator. This was a great moment of invention, self-expression, collaboration, as well as full-body engagement in an imagined world, if only for a short time. In this brief moment, these kids built and immersed themselves in their own world, inspired by the

Fig. 4. A child entering the Pool Noodle Forest.

Fig. 5. A child playing in the immersive experience beyond the Pool Noodle Forest.

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exhibit components that we had provided, but combining them in a way that was all their own.

Mommy, Come Look at the Sublime

Our final pop-up of the summer was a "forest" of hanging green pool noodles that led into a silver-lined room fitted out with low lighting, a glowing alien campfire, and numerous loose parts (figs. 4 & 5). This pop-up, in particular, was designed to test how kids would respond to an entire immersive space; would they be overwhelmed, uninterested? Then, one morning, we witnessed the power of connection to something strange and beautiful – what Burke calls the sublime – as an entry point for our visitors. The overwhelming sensory and aesthetic experience of moving beyond a field of swaying noodles, and emerging into a dimly glowing space, evoked a strong emotional and physical response in a five-year-old boy and his mother. As they approached the Pool Noodle Forest, the mother showed apprehension and refused to go in. The boy could not contain his excitement and disappeared into the noodles. After some time, he reemerged, held out his hand, and said, "Come mommy, into this wondrous world with me."

She followed him and they spent nearly an hour together in the nighttime campsite on the other side of the noodle forest, building an imaginary campfire and roasting imaginary marshmallows with twinkling lights overhead. In an interview afterward, the mother admitted she would never have gone in without her son. The child had recognized something astonishing beyond the unknown and had taken ownership of his experience, playing tour guide for his reluctant mother, allowing them to immerse themselves in deep play in the space. He proved to us (as we subsequently saw time and again) that kids often had a greater tolerance for the sublime and eagerly sought out strange places as jumping-off points for their own world building.

Following our summer of prototyping, we felt confident that we had found some basic, effective ways to support imagination and creative capacities. If we designed open-ended, immersive, active experiences, providing examples of creative work as inspiration while also providing opportunities for visitors to go their own way, we were fairly certain that kids would have the opportunity to be creative. We also felt confident that we could translate these learnings to large-scale exhibitions, developed in collaboration with artists from the community. The exhibitions, imbued with the imagination of the artists (as well as the exhibits team) would serve as creative inspiration for our visitors.

> **In this brief moment, these kids built and immersed themselves in their own world, inspired by the exhibit components that we had provided, but combining them in a way all their own.**

Year-One Findings

With insights gathered, design parameters set, and a budget of $60,000 per installation in place, we developed an open call for local artists to collaborate with us to build temporary installations in our new, 450-square-foot Creativity Initiative Immersive Gallery space. We had 65 artists apply, and with assistance from a panel of local artists, designers, educators, and staff, we chose three proposals that shared a desire to create an open-ended environment but differed greatly as to materials and artistic expression.

The Spectacle and the Embodied

The first installation in year one was *Extravagant Properties* (fig. 6), created with Nick Carter, a Providence-based visual artist specializing in texture, form, and color. Its focal point was a central 25-foot-long one-point-perspective ramped tunnel emblazoned with chevron patterns and highly saturated color gradients, loosely based on a design by 14th-century Italian architect Francesco Borromini. The tunnel's length, height, and platform configuration were designed to be fully accessible by wheelchair and walker.

At the far end of this tunnel was a small, curious, mirrored box inhabited by a shiny, mysterious, backward-facing golden owl. The tunnel's eye-catching patterns, along with the far-off surprise of the box, encouraged gleeful running. There was enough immersion in this exhibit element that kids sometimes accidently hit the back wall, thinking it went on much further. However, there was

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Fig. 6. Installation view of *Extravagant Properties*.

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not enough to allow for deeper imaginative play; kids ran up and down and then left, looking for more to do. Consistent staff observation of the exhibition (now a part of the daily practice of our staff), along with visitor interviews, confirmed for us the limits of this installation. Here we had spectacle, but not enough opportunities for kids to use their imaginations to build their own world within the space provided.

Feeling Real

Our final installation in year one was a collaboration with textile artist Brooke Goldstein and her partner, Steve Lubecki. *Feeling Real or Really Feeling* (fig. 7) was set in a rich, simulated outdoor setting complete with astroturf, quilted landscapes, waterfalls, and a distant city. It was paired with a series of activities exploring the odd connections people sometimes make between emotions, senses, and colors. Building on the missed opportunities of *Extravagant Properties*, and constantly evaluating and responding to visitors’ use of the space, we developed a good balance of activity, openness, and multisensory immersion.

Over the three months that *Feeling Real or Really Feeling* was on display, we observed a number of families spending quality time together in the bright, sunny, green space. These families were treating this exhibition as a tiny vacation, but something was missing. Visitors needed something to focus their energy on while they lounged. We sourced blankets, dishes, and baskets. The exhibits team discussed intently whether or not to include fake food, but ultimately decided that *not* including imaginary food would allow a more open experience. This small but essential addition of some of the trappings of a picnic increased the average amount of time that families spent in the space, as well as the variation of picnic possibilities, leading to deeper imaginative play.

One particular instance occurred when a child was playing in the “fields and forests” of the installation with his family. After a while, he walked through the gallery, past our “sound sculpture” (a multicolored, wall-mounted interactive emitting clucks and cackles) and past a custom electric dulcimer fitted with a screen that turned music into visual waveforms. He ventured beyond the wall of magnetic poetry upon which kids and their adults were creating novel phrases with colorful shapes and words in two languages. He found his way into the far corner of the exhibition and peed on the vomit-resistant, fire-retardant astroturf because he “thought he was outside and it was ok.” We couldn’t even be upset. We made something that allowed this child to take full ownership, becoming so lost in his imagined reality that his inhibitions disappeared.

This event, in concert with the "party in the elevator" and countless others, helped to crystallize our understanding that what our visitors brought and took away was entirely their own – intrinsically motivated, self-directed, open-ended, personal world building. We recognized that in order to allow them to truly inhabit the creative process, we needed to provide opportunities for this kind of world-building without specifically directing it. This meant that each object, experience, and activity we presented had to be tested, engineered, and designed to facilitate the many possible interactions a visitor might choose. We also realized that it was more important to focus on users' clear engagement with the creative process than to fixate on any one kind of specific creative outcome.

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Fig. 7. A child playing in *Feeling Real or Really Feeling*.

Messages to Future Kids (and to our Readers)...

The clearest indication that we had created open-ended opportunities to build worlds was the pleasant surprise that our visitors had begun to preserve and share the lore of the worlds they created with other visitors.

During a week of fort making in the summer of prototyping, we provided kids with unusual building materials and objects, including erasable LCD screens that they could write on. We weren't sure what they would do with the screens, and we were surprised by a group of kids who built a large fort and used the screens to write messages "For the kids who will come after us here." They described what they had built, why, and what life was like in the fort. These builders sent messages to kids that they would never meet, creating a collaboration with strangers across time. This happened many times over the week, with different groups documenting and sharing their created world, leaving a trace for future visitors. They proudly displayed their imagined worlds, making their actions, thinking, and learning visible. We realized that this codifying and sharing was the result of a deep engagement with a most pivotal part of creative practice: reflection.

In 2007, the Lincoln Center Institute, working with philosopher Maxine Greene, had codified a series of outcomes or capacities that could be built by students who engaged in creative practice and aesthetic education. The final outcome was reflection/assessment: "Reflecting/Assessing to look back on your learning, continually assess what you have learned.... This occurs not only at the end of a learning experience, but is part of what happens throughout that experience. It is also not the end of your learning; it is part of beginning to learn something else."[20]

As we reflect on and assess our own exhibition experiences, we hope to share our enthusiasm for embracing a process that prioritizes open-ended co-creation as a primary means of connecting visitors to the practice of creativity. This prepares people to explore, experiment, solve problems, and find meaning in the world around them.

1 This project was undertaken by a team consisting of exhibition developer Jessica Neuwirth, artists and exhibition designers Hillel O'Leary and Chris Sancomb, fabricator Mark DeSantis, and at the beginning of the project, exhibitions director Robin Meisner. Both Sancomb and Meisner left the Providence Children's Museum during the project, but the work would not have been the same without their contributions.

2 The CREATE Framework, developed by the Center for Childhood Creativity at the Bay Area Discovery Museum, synthesizes a great deal of the research on early childhood development and creativity. See *The CREATE Framework: Learning Environments to Develop Creativity* (Sausalito: Center for Childhood Creativity at the Bay Area Discovery Museum, 2016), https://37726n2dobnw25rhl01gna4e-wpengine.netdna-ssl.com/wp-content/uploads/2020/06/Create_Framework_OUTLINED_Lo-Rez.pdf.

3 Partnership for 21st Century Learning (P21), "Framework for 21st Century Learning," (Washington, DC, Partnership for 21st Century Learning, 2007); IBM Corporation, "Capitalizing on Complexity: Insights from the Global Chief Executive Officer Study" (New York City: IBM, 2010).

4 Dr. Kyung Hee Kim of the College of William and Mary first identified the creativity crisis in 2008 and again in 2017. See Kyung Hee Kim, "The Creativity Crisis: The Decrease in Creative Thinking Scores on the Torrance Tests of Creative Thinking," *Creativity Research Journal* 23, vol. 4 (2011): 285–95; Kyung Hee Kim, "2017 Creativity Crisis Update: How High-Stakes Testing Stifles Innovation," *The Creativity Post*, April 17, 2017.

5 Mark A. Runco, "Creativity," *Annual Review of Psychology* 55 (2004): 657–87.

6 Helen Hadani and Garrett Jaeger, "Inspiring a Generation to Create: 7 Critical Components of Creativity in Children, a Center for Childhood Creativity White Paper" (San Francisco: Center for Childhood Creativity, 2015): 6.

7 Anna Craft, *Creativity Across the Primary Curriculum: Framing and Developing Practice* (London: Routledge, 2000).

8 The Providence Children's Museum has grounded its exhibitions and programs in supporting free play since 2007, when then-director Janice O'Donnell steered the museum to take up the cause of defending children's free play. She had been inspired by the adventure playground and playwork movement in Great Britain and the work of Joan Almon and the Alliance for Childhood in the United States.

9 Lincoln Center Institute for the Arts in Education, *Entering the Work of Art: A Guide for Designing Aesthetic Education* (New York: Lincoln Center for the Arts, 2008). The Lincoln Center Institute was founded in 1975 as an education arm of the Lincoln Center for the Performing Arts to engage school children in building skills learned through the arts. As part of creating professional development material, the Institute developed the "Capacities for Imaginative Learning," educational outcomes that can be expected to emerge in children as the result of aesthetic education. In 2013 the Institute was renamed Lincoln Center Education, and continues to lead in the field of arts education in the United States.

10 See Edmund Burke, *A Philosophical Inquiry in the Sublime and Beautiful* (1757, repr. Oxford, Oxford University Press, 2015): 17.

11 See Leslie Bedford's *The Art of Museum Exhibitions: How Story and Imagination Create Aesthetic Experiences* (New York: Routledge, 2014) for an in-depth discussion of exhibitions as aesthetic experiences and, indeed, as art form.

12 *His Twine*, also known colloquially as *16 Miles of String*, debuted in New York in 1942 as part of the exhibition *First Papers of Surrealism*.

13 In his work *Duchamp, Childhood, Work and Play: the Vernissage* (New York, First Papers of Surrealism, 1942), David Hopkins synthesizes first-person accounts describing the children's activities within the installation.

14 Simone Osthoff, "Lygia Clark and Hélio Oiticica: A Legacy of Interactivity and Participation for a Telematic Future" in *Leonardo* 30, no. 4 (Cambridge: MIT Press, 1997): 279–90.

15 Teresa M. Amabile, "In Pursuit of Everyday Creativity," *The Journal of Creative Behavior* 51, no. 4 (2017): 335–37; Teresa M. Amabile, "Reward, Intrinsic Motivation, and Creativity," *American Psychologist* 53, no. 6 (1998): 674–75.

16 Michele Root-Bernstein, *Inventing Imaginary Worlds: From Childhood Play to Adult Creativity Across the Arts and Sciences* (Lanham: Rowman & Littlefield Education, 2014); Dorothy G. Singer and Jerome L. Singer, *The House of Make-Believe: Children's Play and the Developing Imagination* (Cambridge: Harvard University Press, 1990).

17 The Center for Childhood Creativity, "The CREATE Framework: Learning Environments to Develop Creativity, a Center for Childhood Creativity White Paper" (Sausalito: Center for Childhood Creativity, 2015): 3.

18 This list of design criteria was developed through our work on the Creativity Initiative and our work supporting free play in exhibitions at PCM. Dr. Robin Meisner, former Director of Exhibitions at PCM and current Senior Director of Child Development at Boston Children's Museum, spearheaded the codification of criteria for designing for free play in PCM's Learning Frameworks. We are indebted to her for that work.

19 The summer of prototyping would not have been possible without Chris Sancomb, former Exhibition Designer at PCM and current Assistant Professor of Design at the University of Connecticut. His work in prototyping and spatial and logistical design allowed for fast and flexible testing and execution of our ideas.

20 Lincoln Center Institute, "Lincoln Center Institute Capacities for Imaginative Learning," New York (2007); https://imaginationnow.files.wordpress.com/2011/03/capacities.pdf.