Making Space for Innovation

Sampling of Making and Tinkering
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Presenters
Monika Mayer, Lawrence Hall of Science
Lydia Beall, Museum of Science, Boston
David Wells, NYSCI
Karen Wilkinson, Exploratorium
Summer Brandon, Science Works
Lisa Brahms, Children’s Museum Pittsburgh
Keith Braflaadt, Science Museum of Minnesota
Lianna Kali, Exploratorium
Elena Baca, Explora
Prinda Wanakule, The Tech
Peggy Monahan, NYSCI
Dana Schloss, TELUS Spark
Making & Tinkering Spaces in Museums

Philosophy

Based on “constructivist” theories of learning which assert that learning is actively constructed by the mind of the learner. “Constructionism” takes it even further and suggests learning happens more effectively and new ideas emerge when people are actively engaged in making an external and tangible object.

-Piaget/Papert
21st Century Learning Skills

“In today’s rapidly changing world people must continuously come up with creative solutions to unexpected problems. Success is based not only on what you know or how much you know but your ability to think and act creatively.”

Mitchel Resnick, Learning and Leading with Technology, 2008
Common Goals

Self-directed learning
Getting started, getting stuck (and un-stuck), deciding when to stop

Personally expressive
Individually meaningful outcomes, evidence of thinking and sense-making

Familiar/unfamiliar
tools, materials and compelling science, focus on process not end goal

Collaborative possibilities
Impacting the thinking, learning and play of others
Opportunities

- Deep engagement in self-directed learning
- Teaching materials and tools literacy
- Engaging visitors in using 21st-century learning skills
- Connects us more with our community
- Brings in new audiences
- Establish and cultivate community partnerships
- Iterative process to develop new programs and exhibits
Challenges

- Sustainability – cost due to level of facilitation
- Not a cookie cutter recipe
- Growth mindset
- How do you create a tinkering culture in your institution?
- Material management & storage
Lessons Learned

- Think big - Start small!
- Get buy in from your organization
- Facilitation is key - Invest in staff and ongoing training
- Design process should be iterative addressing continual feedback from audience
- Encourage risk taking and embrace failure!
- Take advantage of local networks and resources
Agenda

- Arrival & Icebreaker
- Overview and Framing
- Rapid Fire Introductions
- Hands-on Activities
- Small Group Discussions
- Wrap up
Materials Nerds Meet-Up

Tonight @ 7:00pm

Raleigh Times Bar
14 E Hargett St.
ASTC Community of Practice (CoP)

Join our ASTC Community of Practice (CoP)
Making & Tinkering Spaces in Museums

CoP Meet-Up:
Monday, 10/20 @ 7:30am
Marriott Hotel, Ballroom B
MAKING + LEARNING

WWW.MAKINGANDLEARNING.ORG
Making Space for Innovation: Sampling of Making & Tinkering Spaces
FUNDAMENTALS OF TINKERING:
We’re offering it again starts July 22nd
Cyber learning
learning through direct experience
Da Vinci’s Garage – Tinkering Criteria

• **NEW:** Introduces something new... skill, material, process, way to use something familiar

• **FORKS:** Opportunities for iteration & divergence

• **LOW FLOOR – HIGH CEILING:** little or no barrier to get started, can expand for a wide range of ability/age

• **ENERGY:** Fun, playful, or enticing

✓ **ADDICTIVE:** We love it and get sucked in, potential for significant dwell time
Engineering Design Workshop

Museum of Science, Boston

- Opened in 2007
- 625 square feet
- No doors
- Open for two hour blocks
- Average visitors per hour: 150
- Average interaction ~20 minutes
- 68% visitors are families, 26% are field trips, 6% are adults without children
Selected Activity Criteria

• **Multiple Solutions**
  There are several (or more!) different designs that satisfy the goals of the challenge.

• **Multiple Goals**
  The challenge offers visitors the option of choosing their goal (e.g. the fastest or slowest bobsled) or asks visitors to balance competing goals (e.g., cheap vs. fast, strong vs. light).

• **Testable**
  The success of the design can be measured using reliable, non-subjective tests.

• **Real Context**
  The challenge harkens to a real world problem without being too vague or too forced.

• **Short Iteration Time**
  Each possible solution is relatively quick to build and test.

• **Noticeable Improvement**
  It is possible to achieve noticeable, measurable improvement by improving the design.

• **Non-Traditional/Museum Specific**
  The challenge is different from typical classroom activities such as bridge designs or egg-drop challenges. The experience does not replicate something that a typical visitor can do at home or at school.

• **Gender Neutral**
  The challenge, materials or context is appealing to both boys and girls.
Design
- Personalization
- Maximize Resources
- Expressive
- Collaboration
- Flexibility

Bad Ass MoFo
4 exhibit spaces for tinkering and creative problem-solving
Serving group and family visitors, K-12
Design Lab

Ingredients

- Broad invitation
- Problems worth solving
- Materials literacy
- Divergent solutions
Little Makers

Early Childhood Education and Family Learning Initiative
Little Makers invites young children and their families to tinker, design and make together.
Materials Literacy And Early Tool Skills
Science in the Everyday
Scientific Inquiry Skills and Mathematical Thinking
Creative Thinking and Divergent Solutions
Science is Storytelling: Documentation & Reflection
Parents as Co-Learners and Science Teachers
Ingenuity Programs
Lawrence Hall of Science

The Ingenuity Lab

Design Quest exhibit
Design Criteria

• “Low floors, high ceilings, and wide walls”
• Multiple goals and divergent solutions
• Environment as the third teacher
• Familiar materials and real tools
• Testable
• Real world context
• Short iteration time
• Parents as co-learners and science teachers
• Gender neutral and appealing to all ages
Our goal is for our visitors to discover their own capacity for innovation.

Design Criteria

- Learning by doing
- Facilitated, but learner-driven
- Variety of solutions
- “Just right” constraints
- Inspires creativity and innovation
- Empowers further exploration
- Spirit of STEAM and Maker movements
## Interchangeable Criteria in Education & Exhibit Development

<table>
<thead>
<tr>
<th>Education Program Criteria</th>
<th>Exhibits/Exhibit Environment Criteria</th>
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<tbody>
<tr>
<td>manipulate possibilities</td>
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<td>interest</td>
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<td>support</td>
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<td>location</td>
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<td>Learning Practice</td>
<td>MAKESHOP Principle of Design</td>
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<td>Inquire</td>
<td>Making experiences encourage exploration and inquiry through access to a variety of real materials, tools and processes.</td>
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<td>Tinker</td>
<td>Making experiences are process-oriented, and provide opportunities for extended purposeful play, testing, risk-taking and evaluating properties of materials, tools and processes.</td>
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<td>Seek &amp; Share</td>
<td>Making experiences encourage learners to value, seek out, contribute to, and share expertise with and among the community.</td>
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<td>Resources</td>
<td>Making experiences inspire learners to identify and use familiar tools, materials, processes and ideas in new ways.</td>
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<td>Express Intention</td>
<td>Making experiences are learner-driven, choice-based and empower learners’ development and refinement of identity and personal learning pathways.</td>
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<td>Develop Fluency</td>
<td>Making experiences develop comfort and competence with diverse tools, materials and processes by providing an approachable, accessible and supportive learning context.</td>
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<td>Simplify to Complexify</td>
<td>Making experiences enable learners to demonstrate, expand, deepen, and challenge their understanding of materials, tools and processes, by providing opportunities to connect and combine component elements to make rich meaning.</td>
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The “Activate” program is centered on engagement. The activities are facilitated experiences that are fun, experimental and create opportunities for open-ended creative tinkering, making and exploration. The activities often incorporate classic and emerging technologies as tools for making.
The activities have 3 modes:

• Making activities where the youth or adult visitor engages in a design-based activity and takes it with them if they want. We try to maintain a balance of activities that are simple with singular outcomes with those that are open-ended.

• Interactive demonstrations that may use novel equipment and materials where visitors have an experience but do not take anything with them

• Large scale building and construction activities where visitors can do open-ended construction and de-construction with materials and tools.
Join our CoP

Thank You!