

Making Space for Innovation

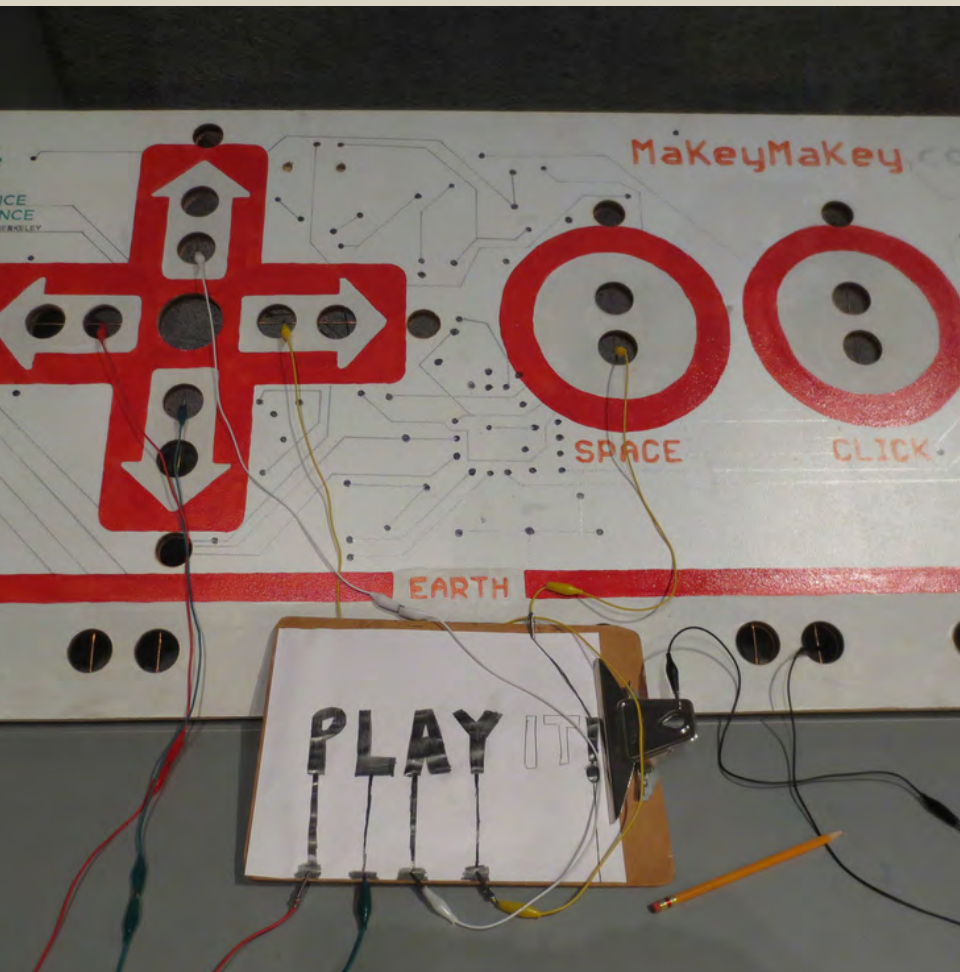
Sampling of Making and Tinkering



Association of Science-Technology Centers (ASTC)
Annual Conference
October 18-21, 2014

Making Space for Innovation

Sampling of Making and Tinkering



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.

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

Marriot Hotel, Ballroom B

children's
museum
PITTSBURGH

MAKING + LEARNING



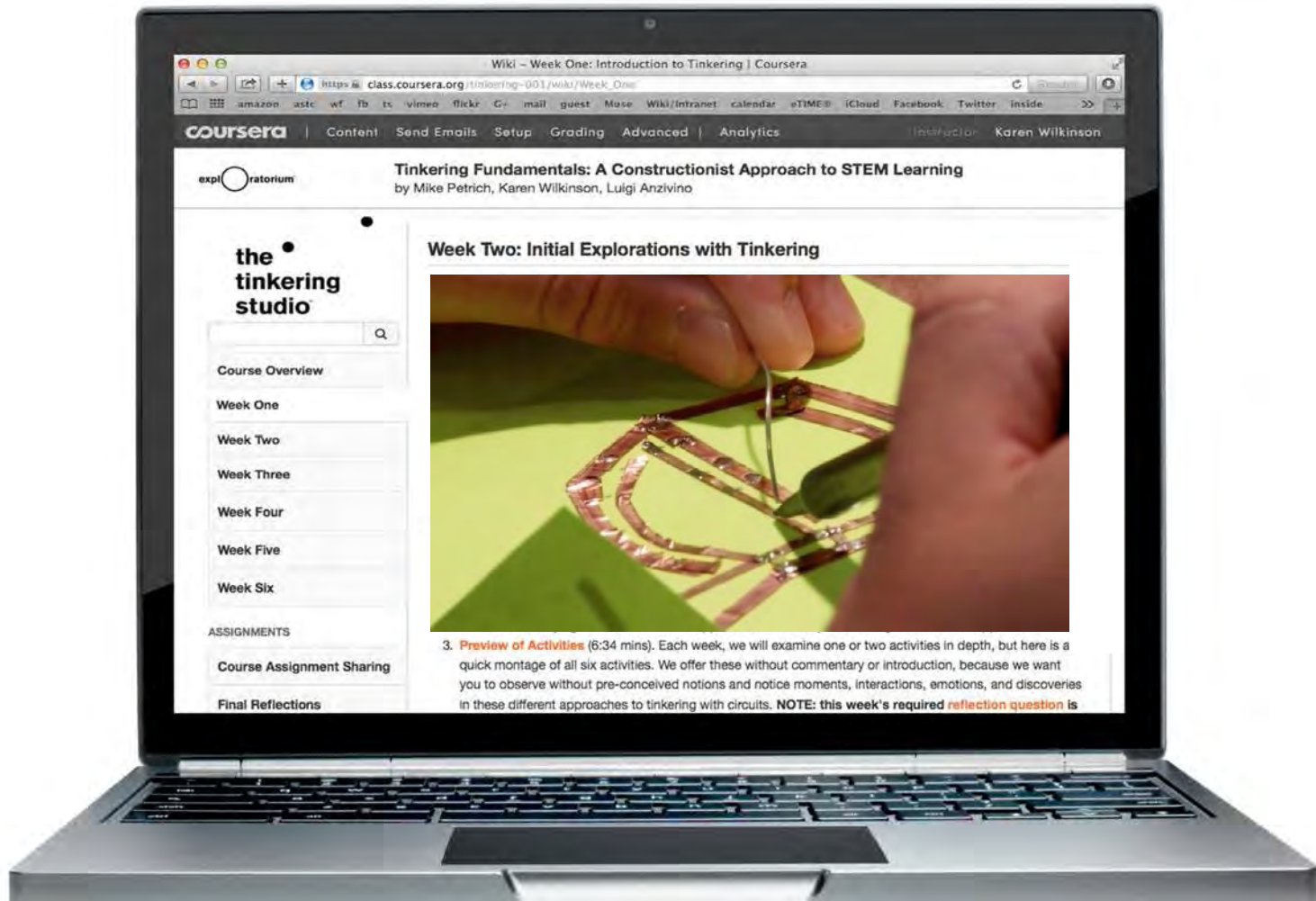
WWW.MAKINGANDLEARNING.ORG

Making Space for Innovation: Sampling of Making & Tinkering Spaces

The tinkering studio

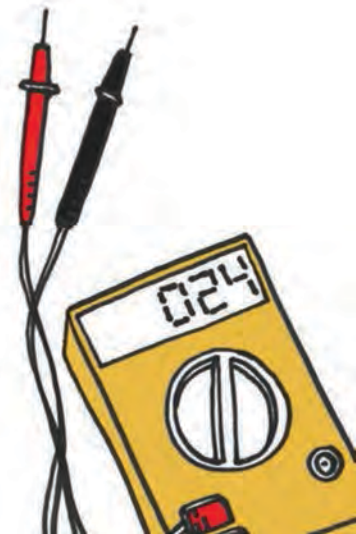


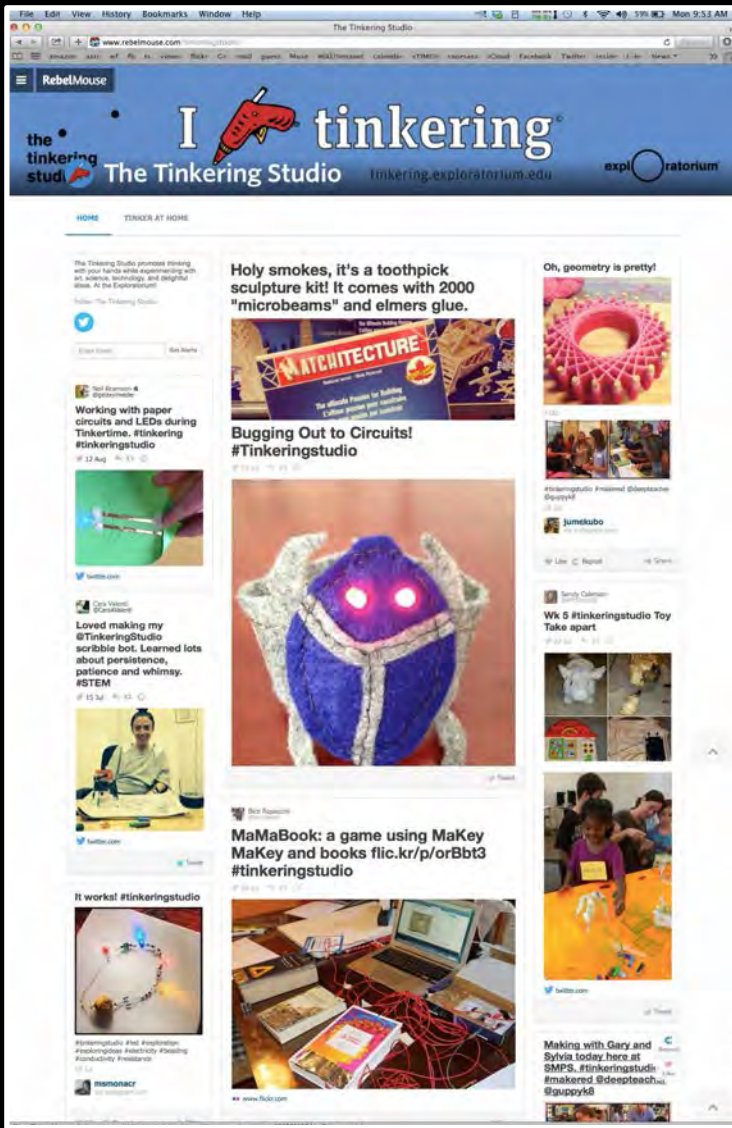
FUNDAMENTALS OF TINKERING:





We're offering it again
starts **July 22nd**





Cyber learning
learning through direct experience

ENTER

Da Vinci's
Garage

Science Works Hands-on Museum





Da Vinci's Garage – Science Works



Da Vinci's Garage – Science Works

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



UP FOR GRABBING & GETTING MADE

RELOCATED
CLOSED

TELUS
Spark
The Way Things Get Done



TELUS
Spark
THE NEW SCIENCE CENTRE

UP FOR SOMETHING A LITTLE MORE DIFFICULT



TELUS
Spark*
THE NEW WAY TO LEARN



TELUS
Spark*
THE HIGH-SCIENCE CENTER



Open Studio

TELUS
Spark*
THE NEW SCIENCE CENTER

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





Engineering Design Workshop

Family Activity

62



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.



Makerspace @ ny sci



Makerspace @ ny sci



Makerspace @ ny sci

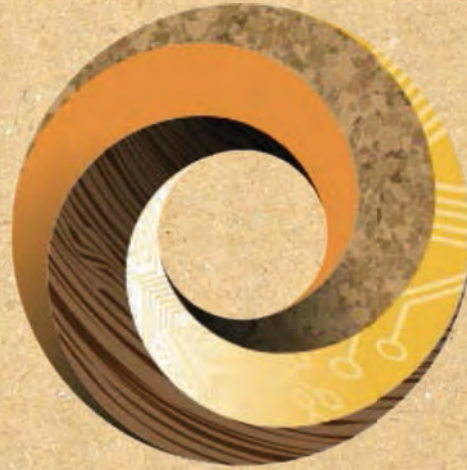




Bad Ass MoFo

Design

- Personalization
- Maximize Resources
- Expressive
- Collaboration
- Flexibility



designLab



4 exhibit spaces for tinkering
and creative problem-solving

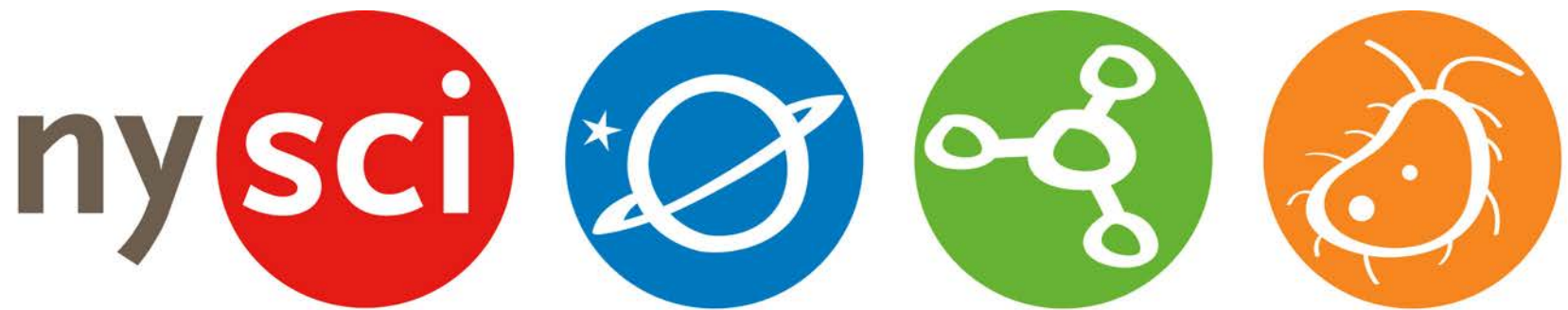


Serving group and family visitors, K-12



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.**



Little Mud Makers at World Maker Faire





Superhero Science





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



THE LAWRENCE
HALL OF SCIENCE
UNIVERSITY OF CALIFORNIA, BERKELEY



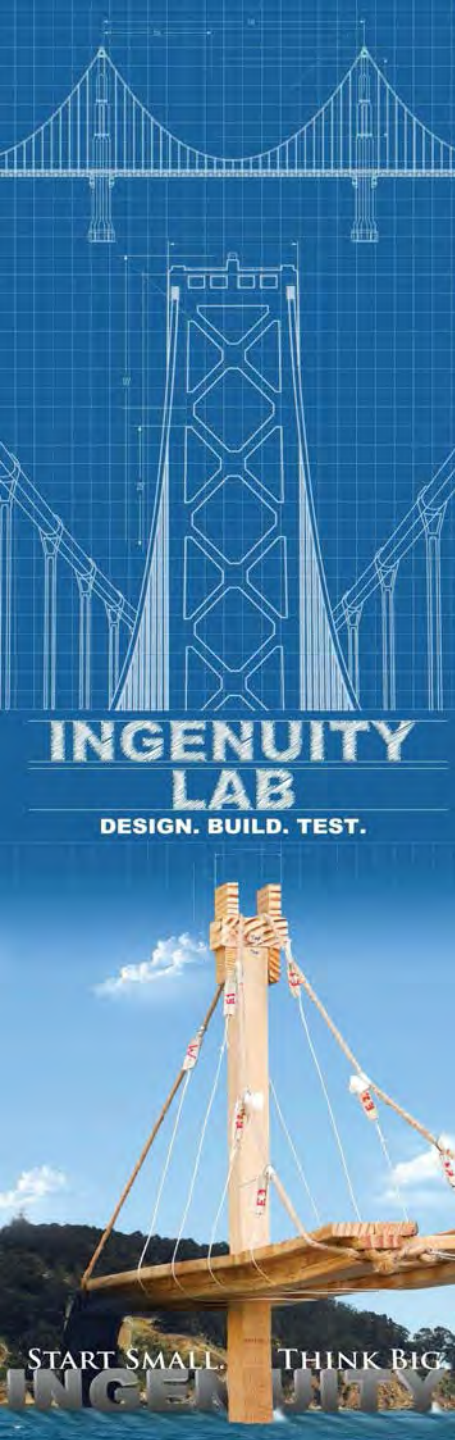
Design, Build & Test in the Ingenuity Lab





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



The Tech Studio Sandbox & Workshop
The Hands-On Science Workshop





The Tech
Museum of Innovation



EXIT

SAFETY SUPPLIES



The Tech
Museum of Innovation

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



Explora – Albuquerque, NM





Lathe Camp | Explora



Interchangeable Criteria in Education & Exhibit Development

Education Program Criteria

manipulate possibilities
interest
pedagogy
aesthetic
affordable
capability
maintenance
safety
accessibility
familiarity
novelty
exhibit relevance
internal relevance
control
ownership
appropriateness
support

Exhibits/Exhibit Environment Criteria

manipulative possibilities
interest
aesthetics
affordability
capability
maintenance
transaction
accessibility
control
safety
support
familiarity
novelty
appropriateness
internal relevance
program relevance
location

children's museum®
PITTSBURGH

MAKESHOP®



children's museum®
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children's museum®
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MAKESHOP Principle of Design

Learning Practice

Making experiences are learner-driven, choice-based and empower learners' development and refinement of interests, identity and personal learning pathways.

Express Intention

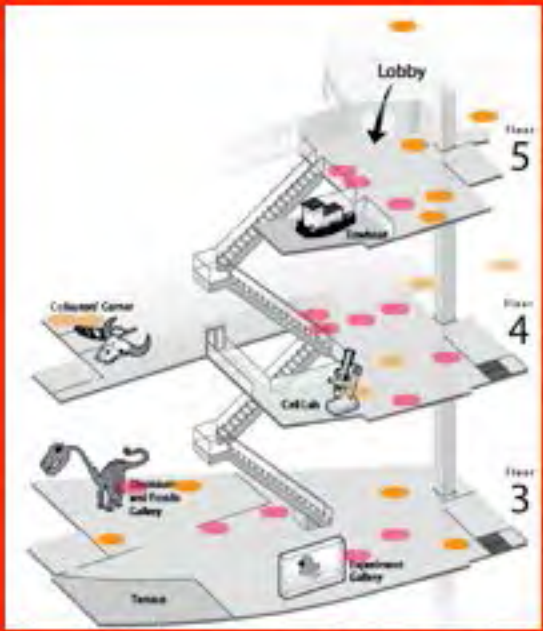
Develop Fluency

Making experiences develop comfort and competence with diverse tools, materials and processes by providing an approachable, accessible and supportive learning context.

Simplify to Complexify

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 meaning.

Science Museum of Minnesota



FUTURE EARTH

LIVING ON A HUMAN-GENERATED PLANET

MORE EXHIBITS INSIDE

The Case of the
Dino Head Disappearance

MECHANICAL ZOO!
Engineer a Zoo and build
mechanisms by exploring
animal design
and mechanical engineering

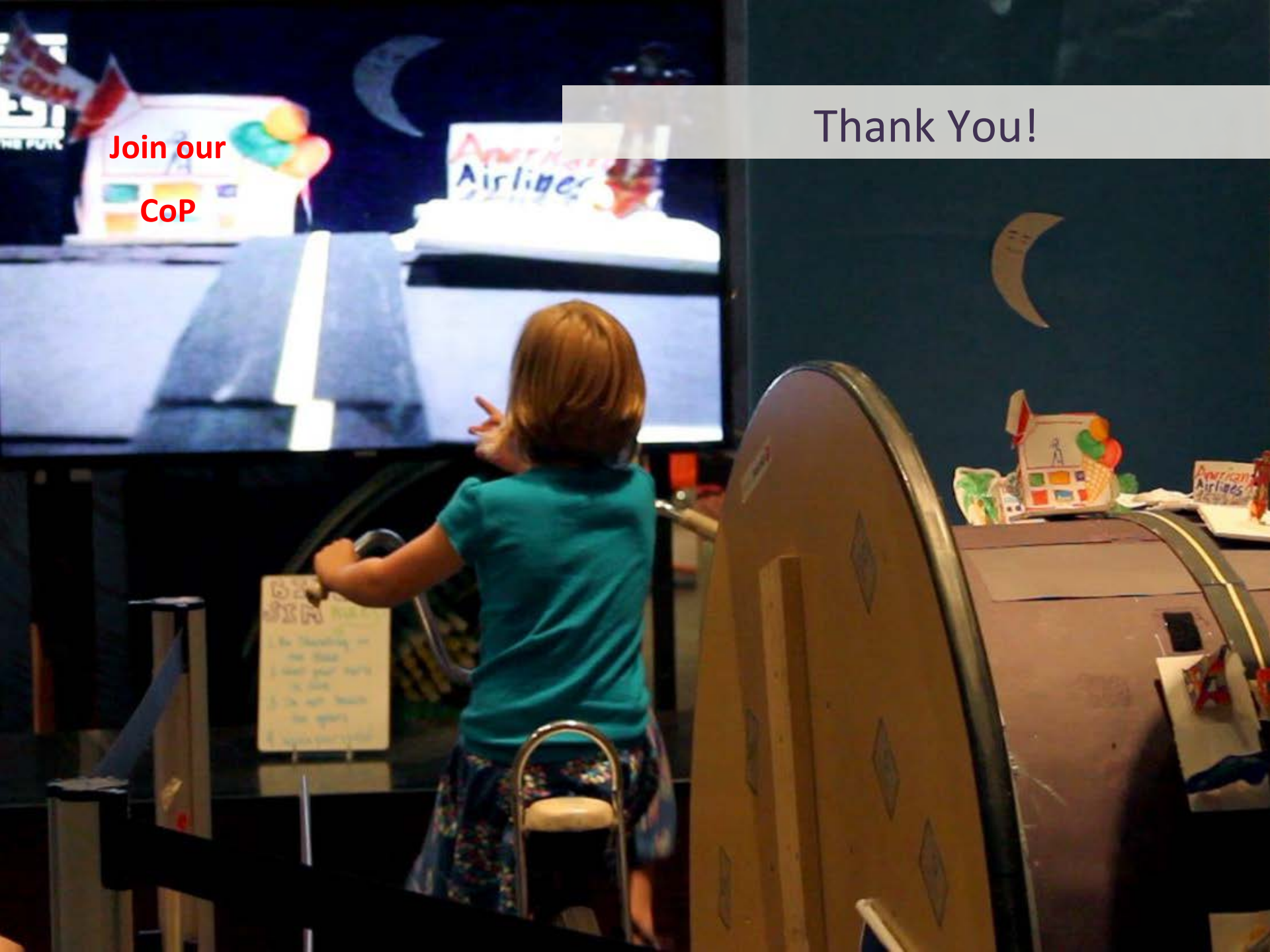




The “Activate” program is centered on engagement. The activities are facilitated experiences that are fun, experimental and create opportunities for open-ended creative tinkering, making and exploration. The activities often incorporate classic and emerging technologies as tools for making.

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!