Learning research in science museums: A current framework, trends, and tools

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Director of Visitor Research & Evaluation
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2008-2011
Program Director
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Context…

exploratorium®

Research on exhibit design…

- Easy success vs multi-option
- Surprising vs familiar
- Indiv. vs jointly controlled
- Content vs inquiry-driven
- Universal vs audience segment

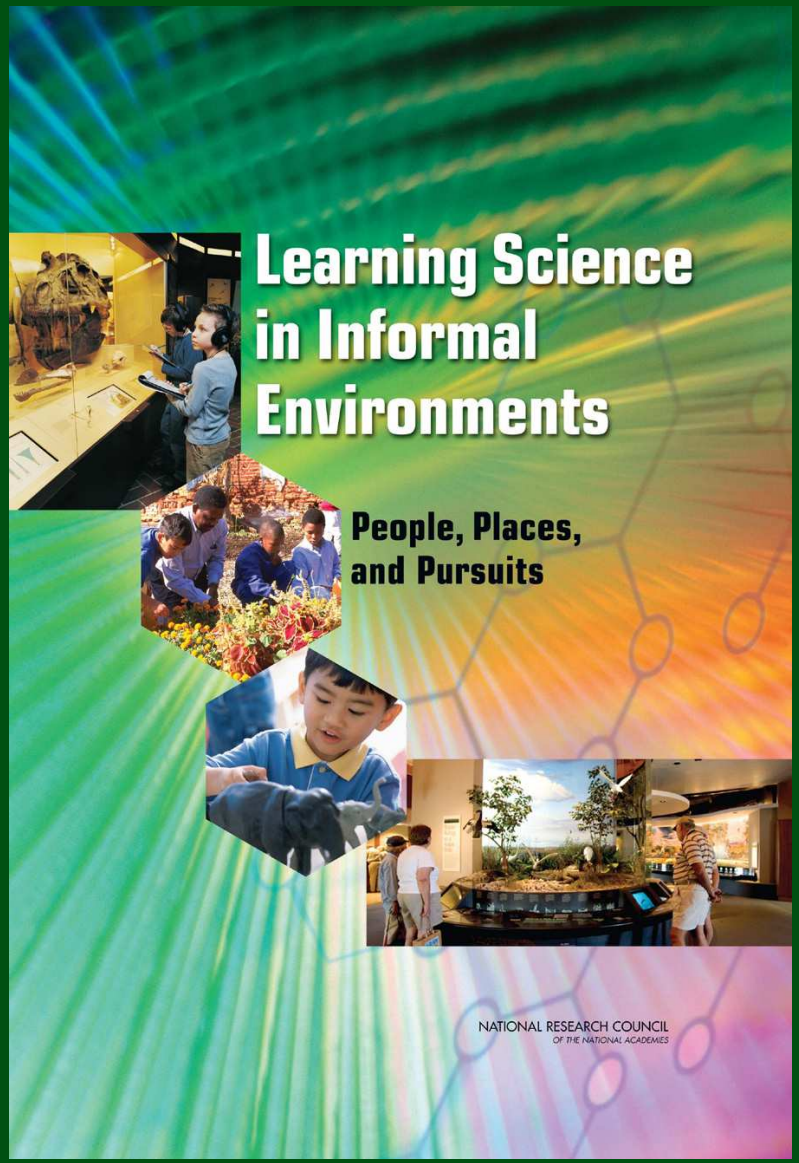
There is much more to study: lighting, layout, design, multilingual approaches, …

Integrating research and practice

Stages

1994	• Evaluation (responsive)
1996	• Evaluation (with initiative)
1998	• Opportunistic research
2000	• Integrated research/development
2000	• Dedicated research

A current framework for learning



Synthesis of research

FREE pdf – go to:

National Academies Press,

"Learning Science in

Informal Environments"

Hard copy: $49.95

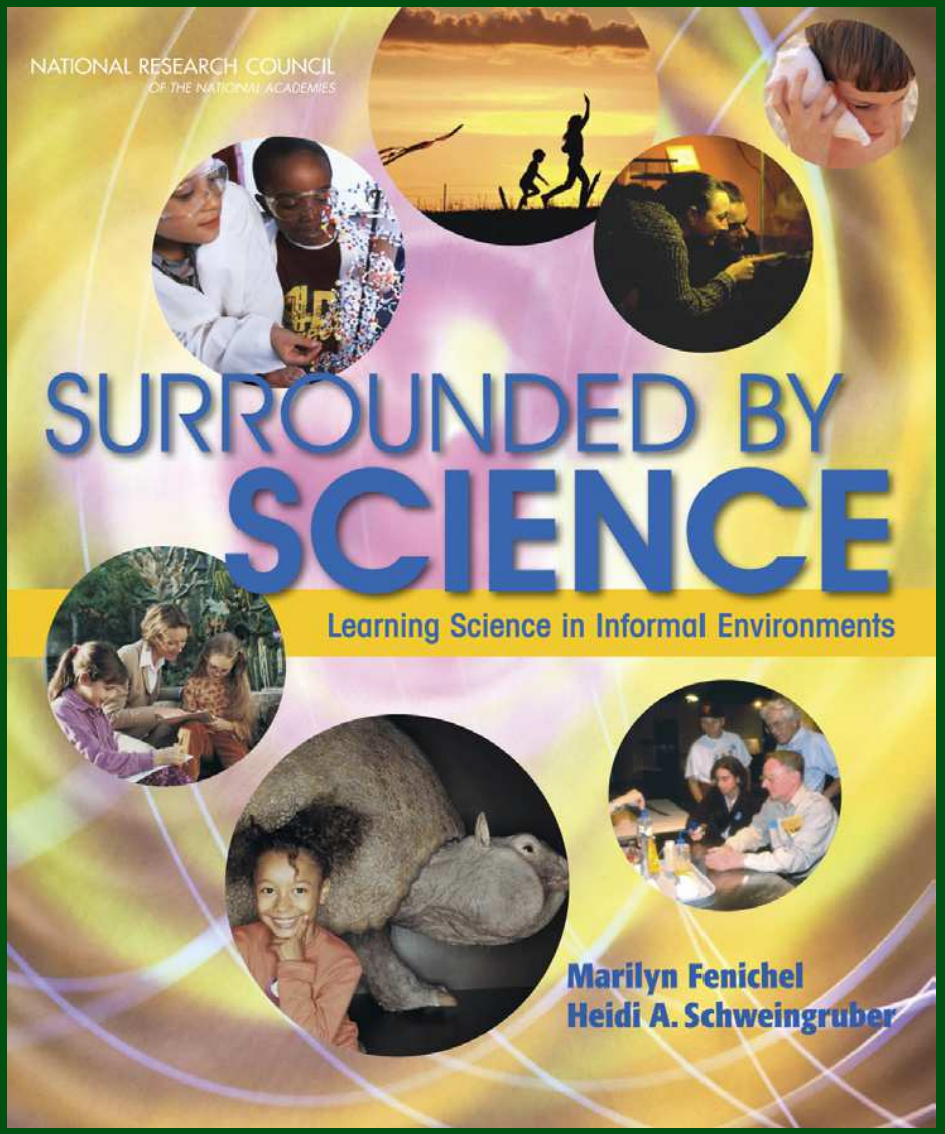
OR

25% Discount code
"INLEAR" $37.46

Follow-on book designed for practitioners…

pdf is free

$24.95 hard copy



Looking at (science) learning through the “six strands” (NRC, 2009)

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Learners in informal environments:

1) experience excitement & motivation to learn

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Conclusion 13

- Currently there are not good outcome measures for assessing the science learning goals of informal settings. Conventional academic achievement measures (e.g., standardized tests of science achievement) are too narrow and not well aligned to the goals of informal providers.

We need assessments of these strands:

- Reliable
- Valid (especially ecologically)
- Allow reflection
- Applicable across situations

3 examples:

- techniques for assessing the strands

within studies on effective design features

Strand 2: scientific concepts

Context:

Study: Do visitors recognize the concept among exhibits in an open floorplan?

Or is it better to have walls around exhibit clusters?


Terminator


LIFE USES ENERGY
Termitarium

Strand 2: scientific concepts

We asked visitors:
“Did you notice any common idea or theme in this area you’re just leaving?”

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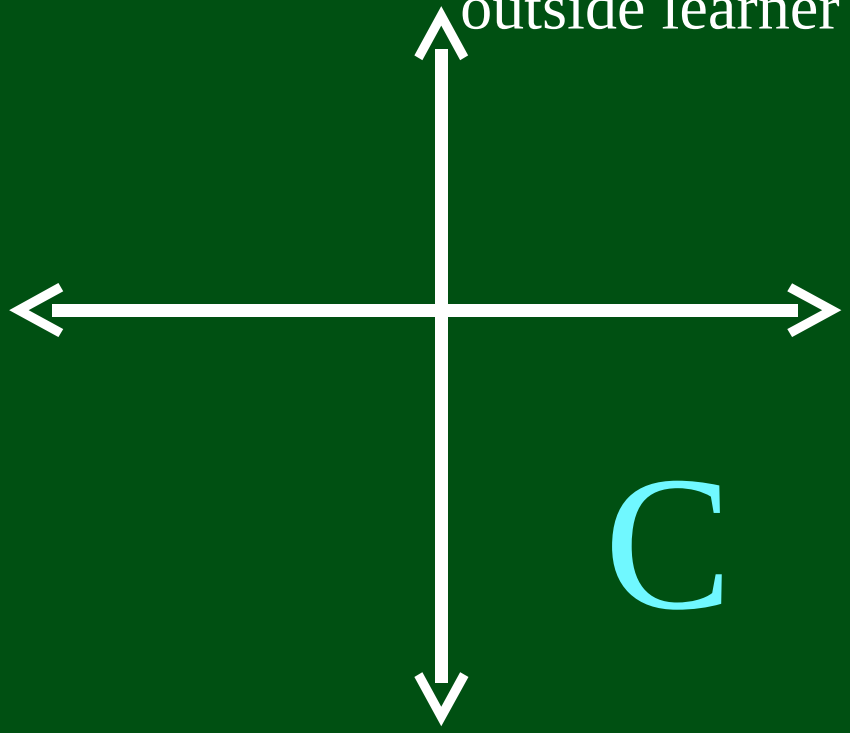
No walls	30%	
Walls	51%	$p<0.01$

Strand 3: make sense of the world
(text, explore, question, observe, etc.)

Context:

Study: How can we create and assess "constructivist" exhibits?



(Hein, 1998)

Video clip

Strand 3: make sense of the world
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Question Codes

Action	Explanation	Orientation	Perception	Off-task
(What if?)	(Why?)	(What's this one?)	(See that?)	(Lunch?)

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Response Codes

Uses label	Uses exhibit/discusses (but not label)	Off-task	No response

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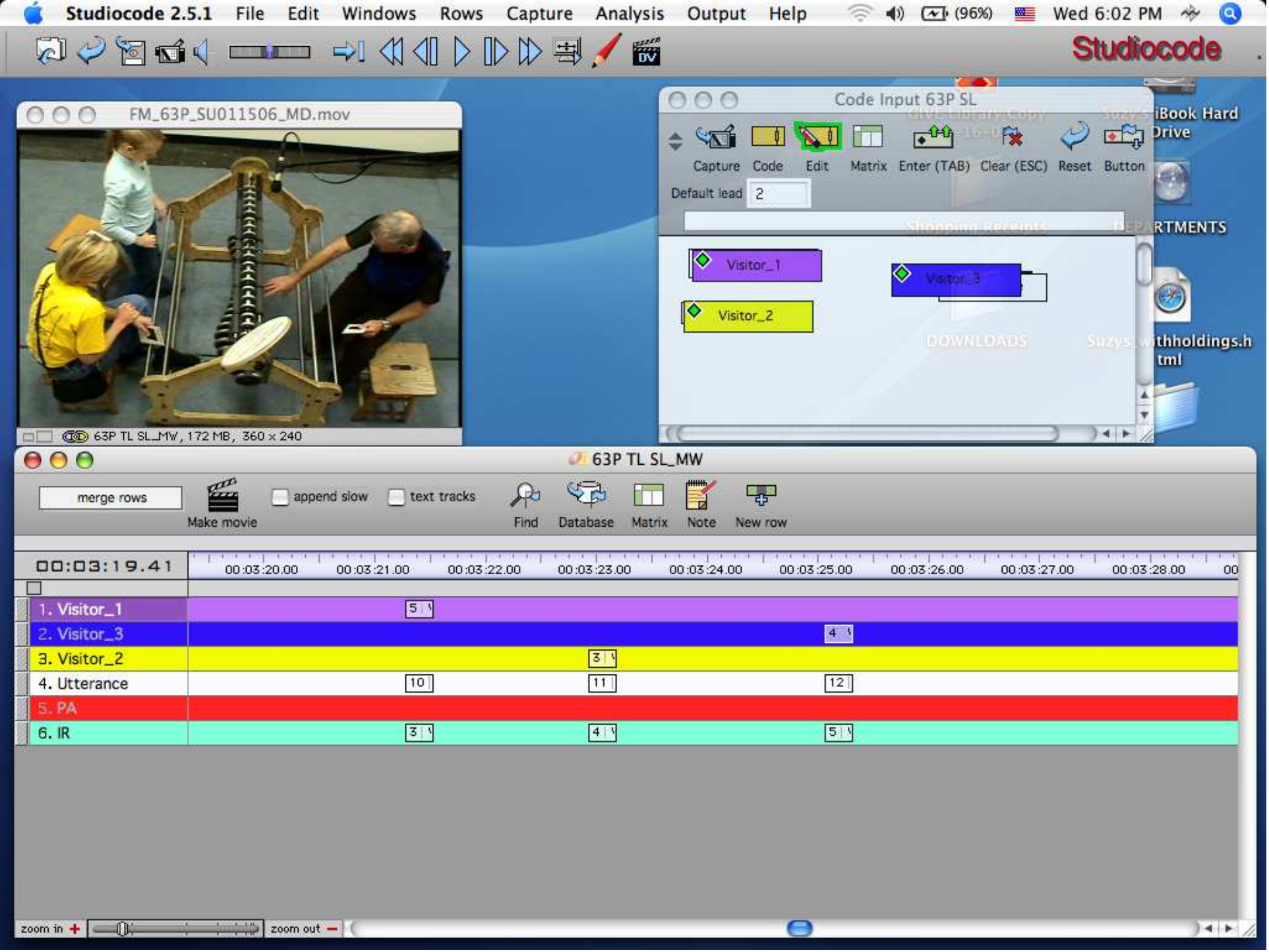
Strand 5: participate in scientific activities with others

Context:

Study: Can we create a program where we help school field trip students to deepen their inquiry at exhibits?

Video: Pre-post field trips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Visitor_2
63P TL SL_MW
merge rows
Make movie
append slow
text tracks
Find
Database
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00:03:26.00
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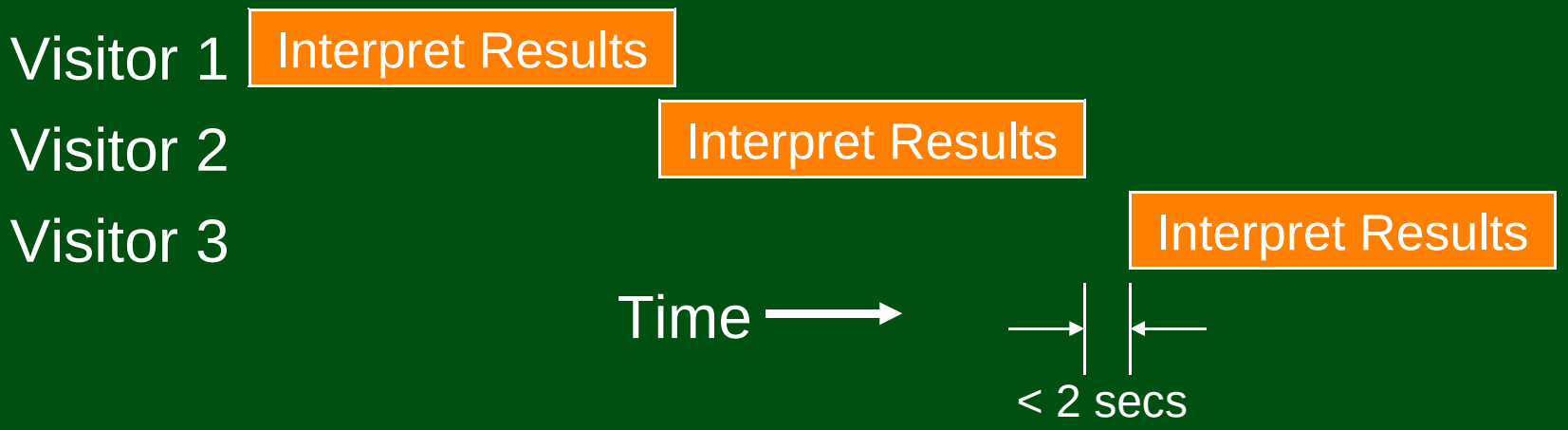
1. Visitor_1
2. Visitor_3
3. Visitor_2
4. Utterance
5. PA
6. IR
zoom in
zoom out

Assessing collaborative learning: Consecutive Interpretations



$p<.05$

Some things to notice:

• Strands are pragmatic, amenable to various theoretical models

• Strands connect well with design concerns of practitioners (exhibit and program-developers)

• There are many research questions about the strands (tracking of learners, tools & practices that support them, esp. for nondominant groups)

Some trends in U.S. science museums

- More participatory
- Extending the experience over space & time
- More personalized
- Blurring boundaries with other learning places

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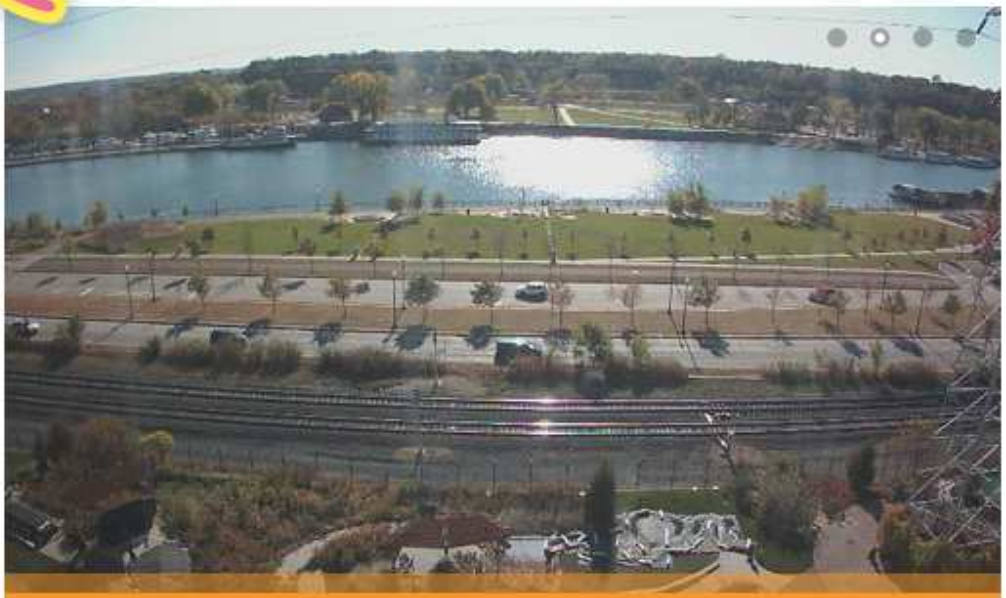

Life on the river

A new shot every day

OBJECT OF THE MONTH

Luring lunkers through

SCIENTIST ON THE SPOT

Through the Looking Glass

ON THE BUZZ BLOG

Butte? But I thought it was a pyramid

Two for Dinner

Minnesota's troubled species lists to grow with moose leading the way

Why did we get so much snow over the weekend?

Night time is the right time to see Earth glowing

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Your Online Museum Design Community

Science of the City II Launches

September 28, 2012

Science of the City II video contest has just launched. From September 27th, 2012 to December 7th, 2012 participants are invited to submit as many two-minute videos on scientific and technological

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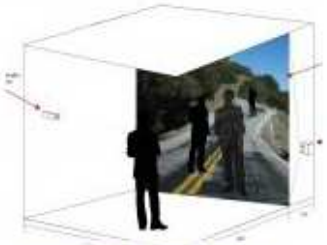
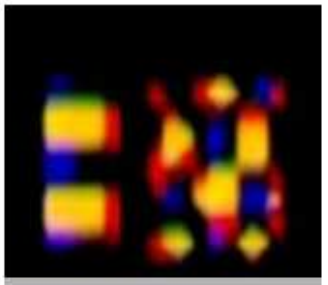
Sustainability

Combinatorics Engin...



Echoes of the New F...



MATRIX CODE.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- Increasing cross-organizational infrastructure & field-building
- Evaluation is widespread, but not research
- Increasing connections between research & practice, mostly through partnerships

caise center for advancement of informal science education

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pi guide

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National Science Foundation Advancing Informal STEM Learning Program

Advancing Informal STEM Learning is a new program name for the Informal Science Education Program at the National Science Foundation. The name of the program has changed from Informal Science Education (ISE) to Advancing Informal STEM Learning (AISL). AISL better emphasizes the priorities of the solicitation and the changes at NSF....[More]

Examples of related research questions

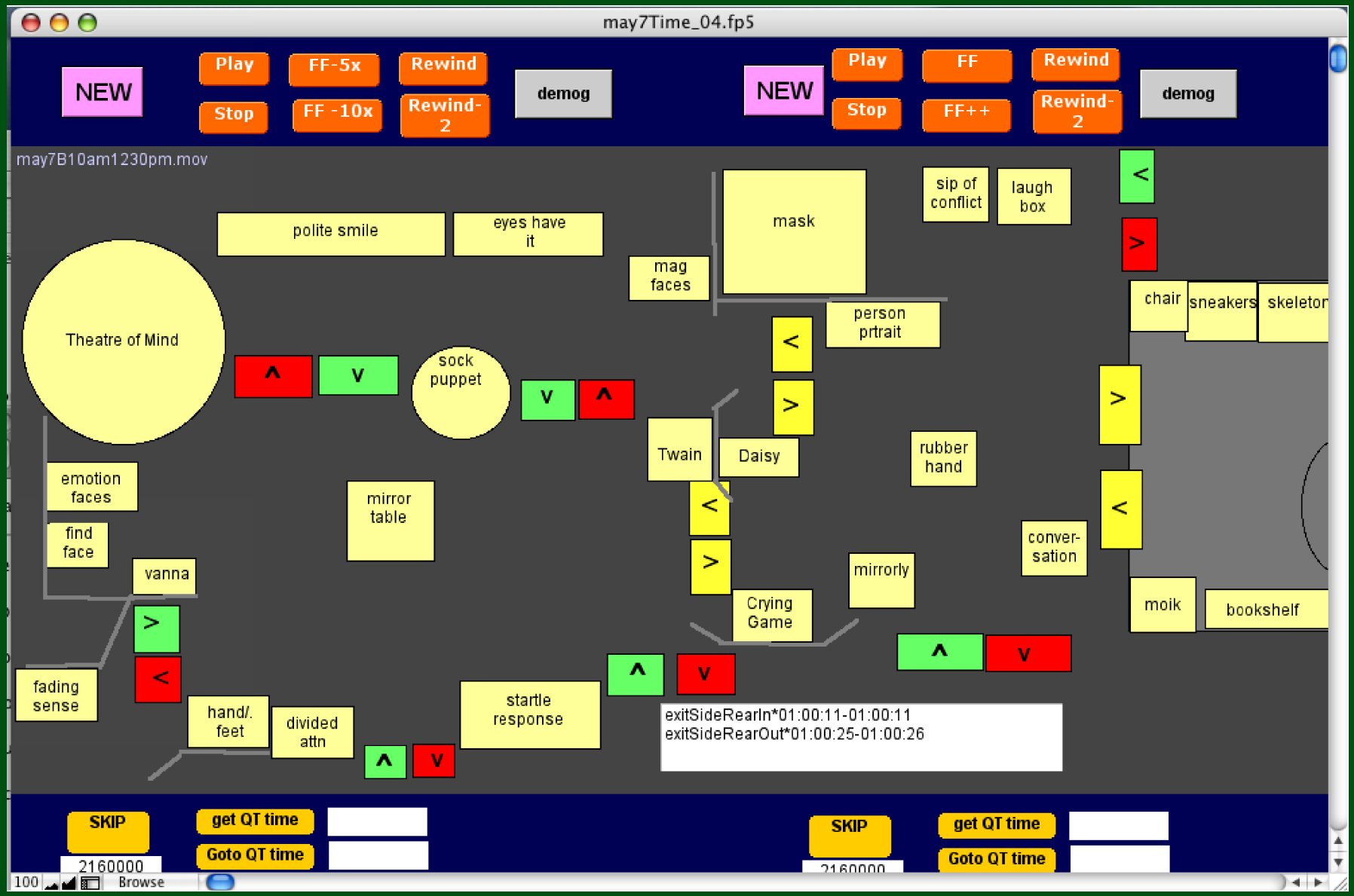
- How can museums support greater participation yet keep high standards of content communication?
- How can museums link with other parts of a learning ecosystem while not assuming every learner has prior experience or access to these?
- How do learners navigate among these resources and how do they develop appropriate media literacy to synthesize, apply and evaluate information?
- How can museums personalize learning without undermining the social nature of the experience?

Beyond exhibitions

- How do museum staff learn and grow in their professional trajectories, and how can they find and use research effectively?
- Can researchers and practitioners create a research agenda together?
- What does “accreditation” look like in informal settings, and how can learning be recognized?
- How can museums contribute to the new science standards, or learning trajectories (school)?
- What are the learning pathways of docents / gudies? Volunteers? Repeat visitors?
- What kinds of mediation lead to what kinds of learning outcomes for visitors?

New tools & technologies

- New technologies for data gathering & analysis:
  - Eye-tracking, fMRI, face recognition, facial expression interpretation, tracking systems.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mask
sip of conflict
laugh box
mag faces
person prtrait
chair
sneakers
skeleton
Theatre of Mind
sock puppet
Twain
Daisy
rubber hand
emotion faces
find face
mirror table
vanna
conver-sation
mirrorly
Crying Game
moik
bookshelf
fading sense
hand/. feet
divided attn
startle response
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exitSideRearOut*01:00:25-01:00:26
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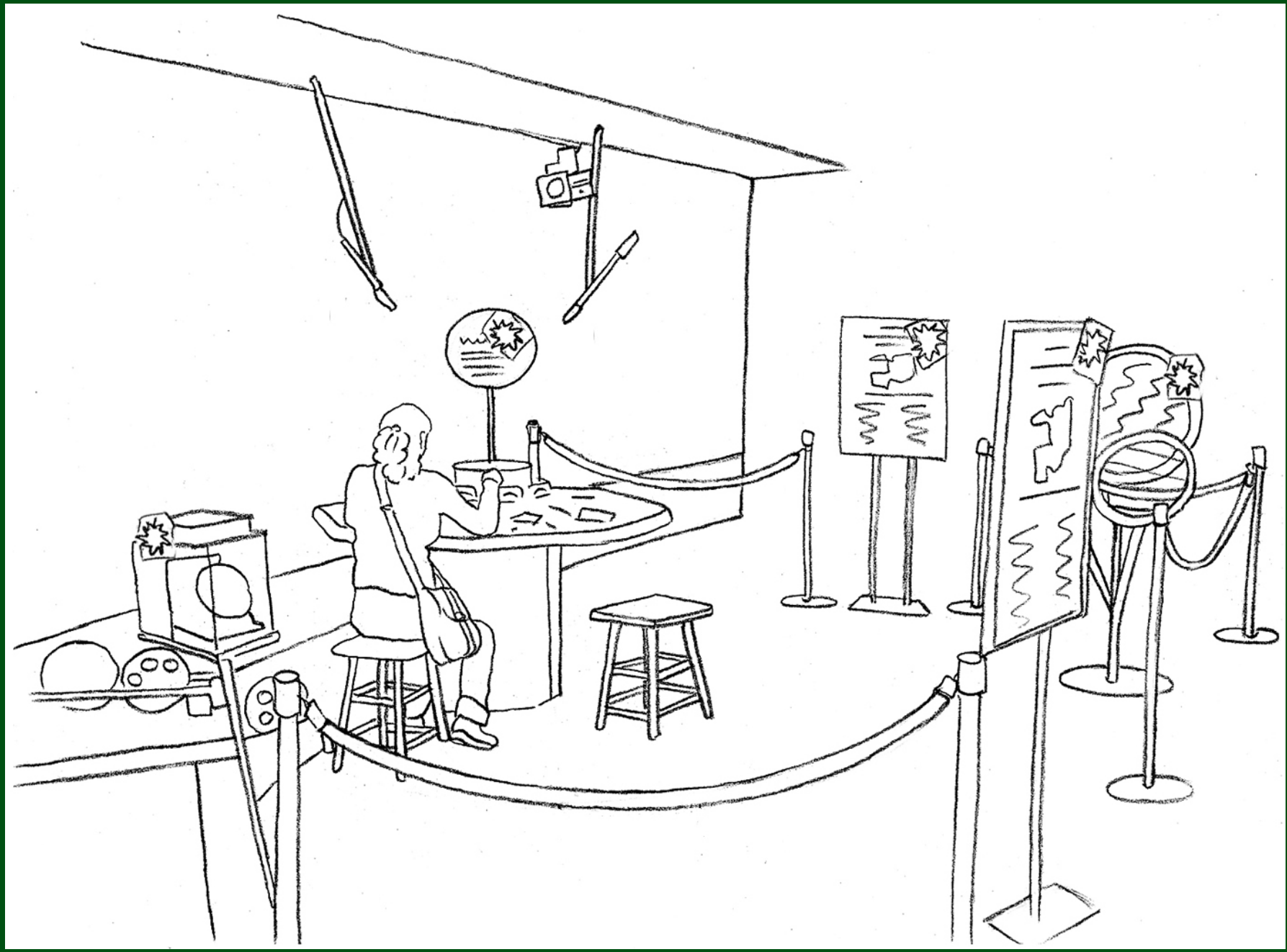
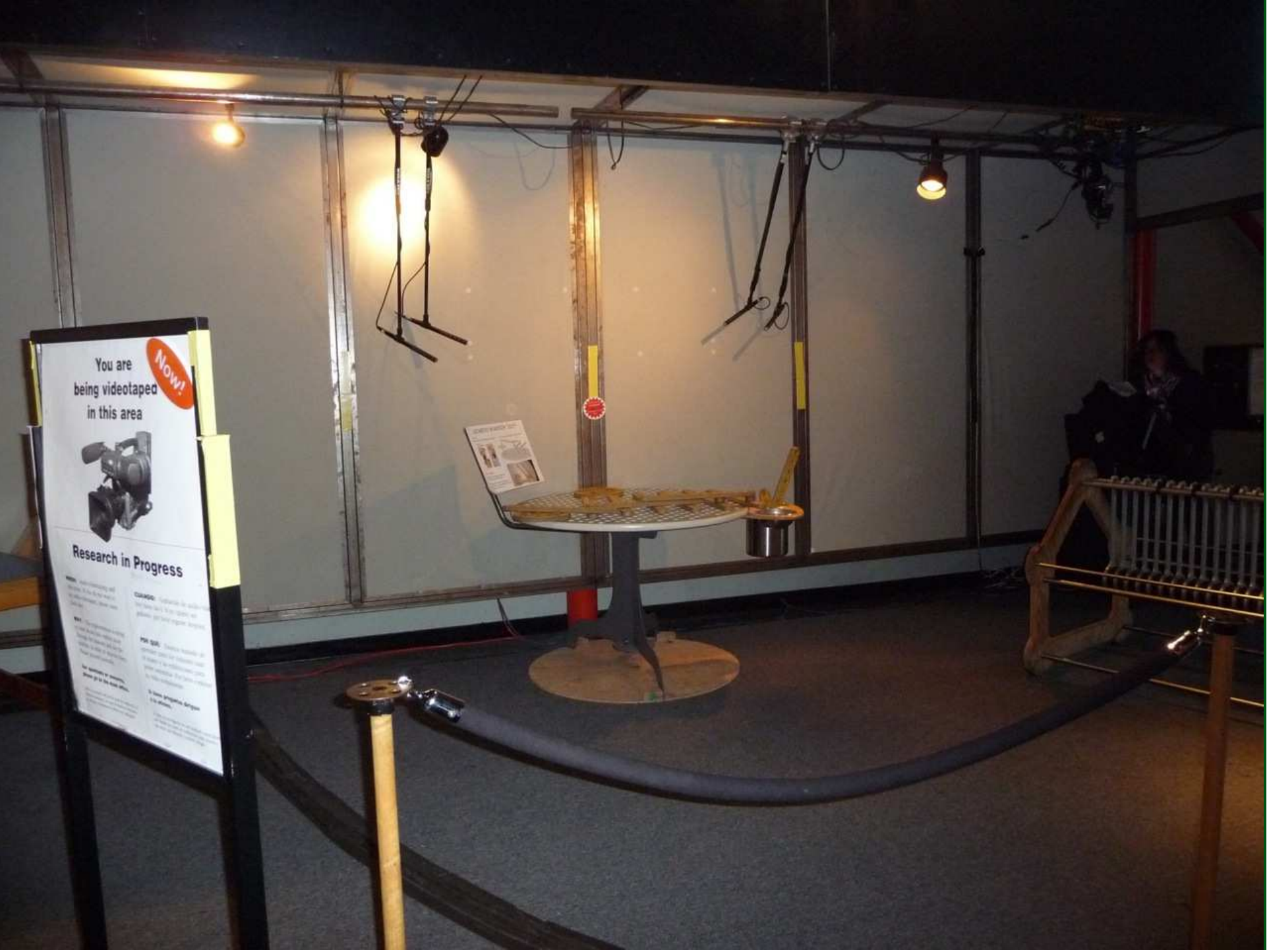
Browse

New tools & technologies

- New technologies for data gathering & analysis:
  - Eye-tracking, fMRI, face recognition, facial expression interpretation, tracking systems.
  - Clickstream data, web analytics, semantic analysis, qualitative analysis, social network analysis
  - Video recording & analysis




You are
being videotaped
in this area
NOW!
Research in Progress

Video can be very powerful

- Works well for finding evidence of learning as a process
- Gets you “in the trenches”
- Can support systematic, deeper studies
- Excellent PD tool for developers

- (Biggest issues: audio, ethics, time)

Photos & videos courtesy of the Exploratorium

Josh Gutwill (Director)

Joyce Ma

Veronica Garcia-Luis

Nina Hido

Toni Dancu

Adam Klinger

Some Resources

Simon, N. (2010). *The Participatory Museum.* Santa Cruz, CA: Museum 2.0.

For Exploratorium Visitor Research studies and projects
www.exploratorium.edu/partner/evaluation.html
For resources related to informal science education research & evaluation
www.informalscience.org
For museum visitor studies
www.visitorstudies.org
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For exhibit community discussions
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For brief summaries of current peer-reviewed research relevant to informal science education
www.research2practice.info
For contemporary work in online museum communities and resources
www.museumsandtheweb.com