

## Learning as Phenomenon

Center for Informal Learning and Schools

How can informal science learning institutions engage communities with the phenomena of learning?

This was a question that three dozen people gathered to address at the Exploratorium on March 18, 2011. Hosted by the Center for Informal Learning and Schools, a distinguished group of learning scholars and practitioners came together to consider ways that informal science learning institutions – museums, science centers, aquaria, etc. – might engage the general visiting public with *learning* as a social, cultural, and scientific phenomenon. We were interested in identifying how interactive exhibits and programs could engage visitors with a wide range of learning phenomena, such as mimicry, attention, perception, interpretation, modeling, etc.

Our central question was how to address the subject of learning in ways that capitalized on the firsthand, learner-driven, socially collaborative, multi-generational, and multi-modal affordances of informal learning environments (NRC, 2009). What features of learning as a process were important to illuminate? What features of the informal setting could be employed to raise visitors' awareness, interest, and understanding of learning? How could we engage diverse audiences with the interplay of affect, cognition, and embodiment – with the social and cultural nature of learning – with broad views of learning as processes of being, doing, knowing, and becoming (Herrenkohl & Mertl, 2010)?

The one-day meeting began with three short presentations meant to provoke small group discussion. The goal of these discussions was to draw on participants' varied perspectives to identify a broad range of concepts and approaches related to engaging museum visitors with the phenomenon of learning. Just before lunch, four design teams began to work with this palette of ideas to brainstorm possible exhibits and programs. The teams surfaced many ideas, plenty of excitement, and a few cautions about moving forward in this domain.

### Part I. Palette of Ideas

The talks were *How Organizations Shape Contexts for Learning*, presented by Professor Rodney T. Ogawa; *Theories of Learning*, presented by Bronwyn Bevan; and *Science: What to Communicate?* presented by Professor Jonathan Osborne.

*How Organizations Shape Contexts for Learning.* Ogawa drew on the new institutionalism in organizational theory to discuss how organizations conform to dominant social and cultural norms as expressed through regulatory, professional, and cultural scripts that delimit organizations' goals and actions. He also noted how organizational settings consequently enact societal and cultural norms in defining possibilities for learning within those settings. He described how schools were created to meet particular needs, and how their cultural scripts, developed over the last 120 years, today continue to largely define what counts as teaching and learning in the public's mind. Informal science learning institutions, similarly, have been shaped by the founding cultural scripts and norms science education reform movement of the 1950s-70s, in which the scientists who founded the first interactive science museums played a prominent role. The views of this social group and era continue to shape what counts as science (inquiry) and what science learning looks like (playful, aesthetic, intriguing, object/phenomena-based) in the ISE field today. Referencing the Exploratorium's imminent relocation and

reconstitution at Piers 15/17, Ogawa noted that the museum had an opportunity to invent a new form of institution, reflecting the cultural and social practices of today.

**Theories of Learning.** Rather than delving into a particular theory of learning, Bevan addressed three dichotomies that frequently underpin discourse on teaching and learning: namely, learning as transmission/participation; learning as individual/social process; and learning as active/passive. Quoting Anna Sfard (1998), she argued for the need to resist a monolithic ideology of what learning is like in informal settings, and instead to recognize that these apparently dichotomous modes of learning actually coexist, overlap, and create a rich learning environment in museums. For example, most visits to informal science learning institutions include experiences with interactive exhibits, explanatory texts, lectures or demonstrations, and formal and informal meaning-making conversations. Museums thus provide an unusual (because they intentionally plan and provide a wide array of structured activities) opportunity to challenge narrow or stereotypical views of what counts as learning and what counts as knowledge. She concluded with the challenge to consider ways that museums could engage visitors in conceptualizing learning as a journey (spanning multiple timeframes and settings) and not as an endpoint, and to highlight concretely for visitors what constitutes, and what counts as, learning within a learning ecologies paradigm, where learning is understood to happen across multiple timeframes and settings.

**Science: What to Communicate?** Osborne presented current thinking about what constitutes teaching for science literacy. He reviewed the traditional ways of thinking about science literacy as consisting of science content and scientific procedures, and discussed the importance of expanding these views to introduce people to *scientific practices*, particularly scientific reasoning and argumentation. He noted that informal science education, and inquiry-based science education generally, have typically emphasized construction of knowledge, but with an emphasis on getting the right answers, rather than on supporting a dialectic between construction and critique. He argued that there is a need for learners to not just collect and present data, but to examine critically and discuss the results of their scientific investigations to question why things are wrong as well as why they are right. This sort of reasoning and critique can lead to deeper understanding of how things work, rather than just accepting science as a set of facts. He also examined the ways in which visualizations and models, including mathematical models, can serve as tools to complexify understanding of physical phenomena, asking to what extent should informal science learning institutions provide visitors opportunities not just to see visualizations and models, but also to help visitors construct and question them. Would this help visitors understand more deeply how they are tools for learning about and describing the natural world? In closing, he remarked that museums need to decide to what extent they wish to engage learners in scientific reasoning and discourse practices as opposed to their tradi-

#### **Why Museums?**

*The Exploratorium's planned relocation to Piers 15/17 in the summer of 2013 has created a milestone opportunity for the institution to examine and consider its past 40 years of work. As Rob Semper, Executive Associate Director, described at a group dinner the night before the meeting, the social sciences will represent a major new thrust for the Exploratorium over the coming decades. Specifically, the museum intends to expand its past work on memory, language, and cognition to address learning and other cultural and social phenomena. In his talk, Semper described the need for informal learning institutions to more directly engage our communities with the phenomena of learning, to support civic engagement with what schooling, learning, and education will look like in the coming century. The learning sciences is a major new interdisciplinary field of inquiry combining cognitive sciences, developmental psychology, neurosciences, cross-cultural psychology, and cyberlearning (Sawyer, 2006), thus offering a rich scientific domain of inquiry for public audiences.*

tional focus on science as facts or science as inquiry.

## Part II. Brainstorming

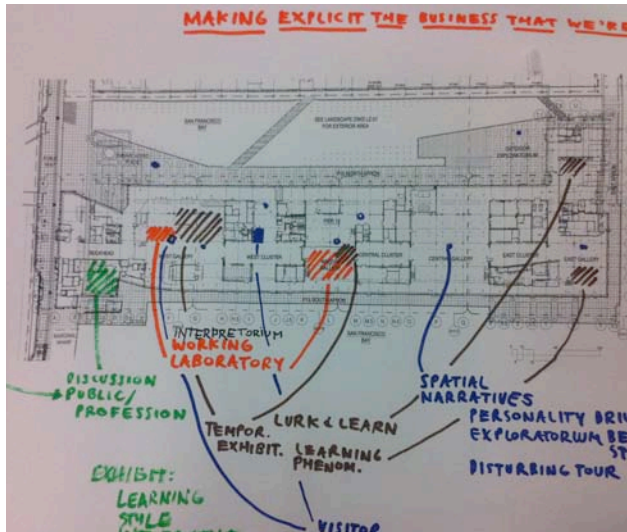
Four design teams met for about 5 hours to develop ideas on how museums could design experiences to engage visitors with the phenomena of learning. In this section we synthesize some of the ideas that point to specific foci or approaches that informal science learning institutions might take.

**Approaches.** In general ideas about engaging visitors with the phenomena of learning took one of four approaches:

1. **Focusing on the Phenomena.** Engaging visitors at exhibits/ programs that specifically addressed the phenomena of learning – e.g., memory, mimicry, or distributed cognition.
2. **Provoking Reflection.** Engaging visitors in reflecting on their own learning at exhibits/ programs that addressed other content areas – e.g., reflecting on how prior experience is enlisted at an exhibit involving measurement and estimation.
3. **Enabling Observation.** Engaging visitors in noticing learning of others – e.g., noticing different roles taken in multi-generational activities or how opportunities to observe lead to different points of entry to engage in an exhibit/ program.
4. **Describing/Revealing.** Using text or electronic media, explore the museum as a learning environment; for example, presenting behind-the-scenes descriptions of the results of visitor research related to a given exhibit; or narrating the historical development of systems of education, such as schools and museums, to help visitors understand the museum as a learning place with particular histories and affordances

**Topics.** Topics for programs and exhibits were widely varied. In general, there was a consensus that experiences at informal settings could challenge stereotypes or narrow definitions of what learning entails. Topics included:

- The social and cultural nature of learning
- Play as a process of learning
- Animal learning
- Evolutionary basis of learning: need, pleasure, use
- Role of mediation in learning
- Redundancies, models, and varying representations in learning
- Interplay of affect, cognition, embodiment in learning



### Observation Stations

Several groups explored the creation of observation stations – places where visitors could view and discuss learning in action. Using a mixture of framing devices (text, models, digital media, or audio guides), visitors at observation stations would be directed to notice (for example) group activity at an exhibit like Turntable (pictured above). Framing devices would prompt visitors to consider how exploration is shaped both by individual and group actions; how ideas/approaches ripple across participants, and how conversations among participants structure the activity.

- Tentative nature of knowledge and knowing
- Learning through one's hands; materiality of learning
- The role of cultural scripts and organizational settings in shaping learning

*Modes of Interaction.* Modes of interaction were also widely varied, but generally intended to build on the socially collaborative and interactive nature of the setting:

- **Interactive exhibits**—exploring phenomena of learning, or prompting reflection about how one learns while exploring another natural scientific phenomenon
- **Observation stations**—e.g., watching visitors at particular exhibits for example where collaboration was key to using the exhibit; watching scientists in museum labs; or observing teaching staff in museum classrooms for summer camps
- **Citizen science projects**—engaging visitors in documenting learning
- **Design projects/summits**—engaging visitors in envisioning systems of education
- **Tools** (written / electronic)—to trace one's own learning during a visit
- **Social interaction projects**—e.g., visitors demonstrating or teaching others a particular skill that they bring with them, such as whistling, yodeling, balancing
- **Guided "interpretorium" tours** (or visitor "field guides to learning")—conducted on the museum floor, highlighting underpinning theories of learning, historical experiments embedded in exhibits, different modes of interaction, etc.
- **Discussion spots**—where people could gather to discuss learning and education.

**Animal, Human, Cyborg, Robot**

*A couple of design teams discussed how to create a small collection of exhibits that could reveal how play operates in both human and non-human animal learning, and how play instantiates (or not) in computer-based learning for adults and for computers themselves. They suggested creating opportunities to learn with another person and also to learn something similar with a computer, in the process highlighting the ways in which intuition, emotion, playfulness, and social desirability operate in engagement and learning for humans (and animals) but not (at least today) for computers/robots.*

*Cautions and Considerations.* Several concerns or cautions were raised for future consideration:

- A central concern was the challenge inherent in simultaneously engaging visitors in meta-cognition (to notice and think about their learning processes) while keeping them fully engaged in those processes of firsthand learning during their visit to the museum. The fear is that asking visitors to zoom out will disrupt their flow of engagement, and could be felt as onerous or pedantic.
- Another concern related to protection of human subjects; in seeking to engage visitors in noticing the learning activities of other visitors there is a danger of encroaching on people's privacy.
- There is a need to design experiences in ways that avoid the possibility of people developing a negative self-judgment when examining their own or others' learning.
- It was recognized that there is always tension between providing people satisfying answers and sustaining their interest. This tension may be particularly salient when engaging visitors with a conception of learning as a process that occurs over time: questioning, not knowing, may be the form of learning that we are seeking to accomplish. How much not knowing, how much frustration, is ok?

## **Conclusion**

There has been growing interest over the past decade or more in how informal science learning institutions can serve as sites for research on learning. At the meeting held at the Exploratorium in March, there was consensus that informal science learning institutions offer a fascinating laboratory for the study of learning – not only for learning scientists but for the general public – because of the variation of learners and learning situations. Each person who enters the museum has a life-long and first-hand experience of learning; they thus have great resources to draw upon to engage with this subject matter.

Highlighting and reflecting on learning in informal science learning institutions provides communities with a significant opportunity to engage in questions of “what counts” as learning, how we know, what we know, how we demonstrate our knowledge, and more generally how learning is a social and cultural process (and therefore how “what counts” varies across contexts). These institutions can use not only their public learning environments but also their community convening powers to gather together educators, policymakers, parents, and students to talk about and envision what learning is and could be, thus taking on an important civic role.

Those gathered at the meeting in March repeatedly remarked on how the processes of uncovering, revealing, and presenting the learning phenomena inherent to the museum experience would provide staff at the institution itself an opportunity to engage more deeply with its pedagogical mission, goals, strategies, and designs for learning.

Thus, expanding a museum’s subject matter to include the phenomena of learning serves its goals of engaging the public with the natural and social world; positions it to engage directly with critical 21<sup>st</sup> century questions about what learning and education entails; and strengthens its professional commitments and understandings of the range of opportunities for learning afforded by the particularly diverse and appealing environments of informal science learning institutions.

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