



THE INFORMAL LEARNING REVIEW

DESIGNING FOR THINKING IN MUSEUMS

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Science museums are under significant pressure from schools to demonstrate cognitive gains in students who visit on field trips. At the same time, science museums often say their role is to engage and motivate, not to instruct. From time to time, the pages of The Informal Learning Review have stirred with debates on “what is learning” and what kinds of impacts museum visits may have. At the “experiencebased” end of the debate, Ted Ansbacher (and I) have argued that “experience is the thing.” That is, instead of being preoccupied by outcomes or impacts that occur after a visit, designers should first design for rich visitor experiences. If the experiences are rich and engaging, then various outcomes may follow, depending on the nature of the experiences. For example, a museum visitor might have visceral, “all-body” experiences in a gyro chair, which may enhance the visitor’s intuitive sense for the physics of spinning. Or, because of an interest in the night sky, a visitor may develop skill in using a star chart, after using one in a simulated night sky. At the other end of the spectrum are those who view exhibits as a curriculum that presents information for visitors to digest. The desired outcome is that visitors can (to put it in a rather jaundiced way) recite more information about the topic after visiting the exhibit than before.

What seems missing from this debate is any discussion of thinking. Museum mission statements may talk about exploring, experiencing, learning, and the like, but how often have you read a museum mission statement that has “getting visitors to think” as a core part of the mission? Thinking, reflection, and contemplation seem like neglected activities, when you observe the frenzy that occurs as visitors pinball quickly from one interactive exhibit to the next. I found it refreshing to visit Explora, a new science center in

Albuquerque, New Mexico, where the exhibit areas have been explicitly designed to support extended involvement exhibits. Instead of large open exhibit areas filled with many interactives, the exhibit spaces are broken down into smaller, attractively designed that allow several visitors to use an exhibit without distraction or interruption by others. (See <http://www.explora.mus.nm.us/> for an overhead photograph of exhibit areas.)

In school and at museums, the concern with outcomes may lead to a lack of attention on what kinds of intellectual skills are needed to get to the outcomes – both inside the head (thinking) and outside (what visitors are doing, the experience). How can museums foster thinking? What kinds of museum experiences facilitate thinking?

Why Should Museums Support Thinking?

There is certainly value in the raw experiences visitors may have in museums, ranging from the immediate aesthetic pleasure upon seeing a painting or a sculpture to the thrills experienced from the gyro chair. These experiences certainly add to our base of physical experiences that contribute to our understanding of the world. But there is certainly more. In school, students learn vocabulary, mathematical formulas, and scientific procedures, but mere knowledge of these specific concepts or techniques is not enough, which is precisely why inquiry is emphasized in science education reform. How can museums get visitors to use what they know, to think? And why is that so important?

The developmental psychologist Alison Gopnik¹ makes a useful distinction between two kinds of learning: the “process of discovery” and the “mastery of what one discovers.” Interactive museums seem to focus on the process of discovery, but give little attention to the mastery. We know that young children are very good at learning – they master language and find out much about how the world works before they enter school. Contrary to Piaget’s idea that preschool children are precausal thinkers, we now know that preschoolers can solve complex cause-and-effect problems, such as figuring out how a machine with gears and switches works. Despite this notion, Piaget also inspired research that shows how young children learn.

Gopnik cites Barbara Rogoff’s research on children growing up in poor Guatemalan Indian villages. These children learned the complex art of making tortillas from scratch, beginning by modeling the flattening of the dough and progressing in the next few years to carrying out the entire process of making tortillas from

scratch. Throughout the entire period, children watch adults and are given constant feedback – coaching - on their mastery of the techniques. Gopnik calls this “guided discovery.”

These Guatemalan children would never learn how to make tortillas if it was taught in school – they would likely learn the vocabulary and memorize the steps involved, but never get to the actual process. As Gopnik says, “Imagine if baseball were taught the way science is taught in most inner-city schools. Schoolchildren would get lectures about the history of the World Series. High school students would occasionally reproduce famous plays of the past. Nobody would get in the game themselves until graduate school.” Likewise, imagine baseball as if it was taught the way science is taught in science museums. There might be a lot of baseballs, bats, gloves, other equipment, and a field. There might be some explanatory signage – “what to do and notice.” What are the missing elements here?

There are at least several, including feedback, modeling or coaching (or some form of feedback), and practice. Engaging exhibits provide visitors with feedback, which is not simple reinforcement. Feedback is a result that can guide our next action, which can be purposeful and thoughtful by building on previous results. Exhibits can stimulate thought by providing feedback and by helping visitors understand what the feedback or results mean. If connection between a visitor’s actions and the results are unclear, then the feedback will not likely support continued and effective interaction with the exhibit.

Modeling is one reason humans are so good at learning when compared to other animals. Children can observe their parents, siblings, or others and incorporate these observations into their own activities. Research has shown how quickly young children can make use of problem-solving strategies they have observed (e.g., retrieving food using a stick), when compared to chimpanzees. Apprenticeships and internships are highly structured forms of modeling. Coaching helps learners master a skill more quickly than they would through trial and error, as the coach guides skill development through very targeted feedback (e.g., posture when making a golf swing, where to hold the hands on the ball when shooting baskets, etc.) and suggestions of new, specific actions to try out. Some museums make effective use of modeling using guides or explainers who can help visitors as they try an experiment, make a basket, etc. Others have physical models that suggest starting points for an activity. For example, in its “Engineer It!” exhibit, the Oregon Museum of Science and Industry sometimes has partially built structures of gadgets that suggest routes that

visitors can try out.

Practice is another activity cited by Gopnik that supports mastery. Simply put, that's how basketball players get into the NBA or how a pianist gets into Carnegie Hall. Since visits to museums are brief, museums do not typically provide visitors with opportunities for extensive practice, but museums can provide more opportunities to try out an activity, skill or interest that a visitor may wish to further develop. For example, imagine a photography exhibit where visitors can practice using a digital camera, see the results, and fine tune their skills with feedback from a museum explainer or by some other means.

Designing for Thinking

Without getting too academic, thinking can be defined as a conscious process that may involve problem-solving, contemplation, reflection, planning, directed experimentation, and, no doubt, many other processes. What can science museums do to support thinking? A fundamental requirement might be a physical environment where a visitor can pay attention to the task at hand. Too much noise and visual stimulation in the immediate environment can certainly disrupt a visitors' contemplation or reflection. Beyond that, I have tried to argue that museums, especially interactive museums such as science centers and children's museums, can support more thinking by:

- Providing visitors with exhibits that provide extensive feedback that can inform them on the efficacy of their actions and that can motivate extended engagement with exhibits
- Providing explainers or guides who can coach visitors without "leading them by the nose"
- Providing visitors with models – whether the models are other people engaged in the same activity or physical models – that can suggest starting points and strategies for visitors to try out
- Providing visitors with some opportunities to practice an activity or skills so that visitors can at least achieve some modest success and be motivated to explore the activity further.

There are some additional things museums can do to encourage visitors to think. Social interaction – conversations – can be very thought provoking, so museums should provide opportunities for social interaction centered around the exhibit at hand. Museums can support thinking - extended engagement with the subject

matter of an exhibit – by providing additional learning opportunities, whether that takes the form of classes, workshops, or website resources. Finally, museums can provide opportunities for visitors to think by having them record their reactions and thoughts on talk-back boards, videos, or exhibit-related listservers.

In this humble article, I have tried to emphasize the importance of thinking as a part of the museum experience. I do not mean for museums to reduce the thrills, aesthetic pleasures, or other valuable and central aspects of the museum experience. I simply believe that many museum visitors would like to think as part of their museum experience, but museums often design exhibit environments that make it hard to think. If museums design for thinking, I believe museum experiences would be much richer as a result.

References

1. An article by Alison Gopnik, "How We Learn," provides a very readable introduction to some of her theories and research. The article was first published in the *New York Times'* Education Life supplement on Jan. 16, 2003. The article can be found at: <http://www.pages.drexel.edu/~pa34/howwelearn.htm>

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