

Rethinking our Goals: Putting *Process* First

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Goals for exhibits and how best to accomplish them are a continuing discussion among museums of all types. In his recent article, "Designing for Thinking in Museums," Robert Russell (2005) contributes to this discussion, pointing out that *thinking*—as an explicitly identified goal for visitors—has been surprisingly absent. Other terms—such as *minds-on*, *inquiry*, *meaning-making*, or *constructing knowledge*—have been used to describe what we want to have happen at exhibits, and, while these are not synonymous, they all put emphasis on what visitors see and do at an exhibit *and* how they mentally process that experience.¹ But even for museums which strive for this kind of engagement in principle, it has often proved to be elusive in practice. Russell, and others, have presented practical suggestions for designing exhibits that will more fully engage visitors and foster thinking, yet I believe an underlying problem remains which has not been fully recognized. Because educational success is so often equated with delivery of information, museums may try to pursue two goals simultaneously—engaging in *inquiry* *and* acquiring factual knowledge. While in the best circumstances these go hand-in-hand, what is not so apparent is that in many situations they actually interfere with each other. My proposal is that if museums are going to be successful in supporting the inquiry process, they need to rethink their goals and priorities—to be more courageous in embracing the visitor's *process* as the primary goal and willing to let go of the more traditional "learning outcomes." Here, once again, I have found guidance in the writings of John Dewey.²

The Importance of Process

John Dewey, nearly 100 years ago, recognized the underlying importance of the *process* by which we generate knowledge: "Science means both a body of facts and a process by which ... knowledge is brought into existence. But in the order both of time and of importance, science as method precedes science as subject-matter." And further: "... science teaching has suffered because science has been so frequently presented just as so much ready-made knowledge ... rather than as the effective method of inquiry into any subject-matter." (Dewey, 1910) "The effective method of inquiry" is what visitors can practice at our exhibits, at their own level and perhaps less rigorously than a scientist, but genuine inquiry nevertheless.

One reason engaging in the *process* of science is valuable is because the skills it develops—among them

observing, rational thinking, and experimenting—are so useful. Not only do they enable a person to continue his or her own development of knowledge, they are of practical use in everyday life—in dealing with the natural world and technology that surrounds us; in solving problems and making choices.

Perhaps the most fundamental reason, however, is that only by working through the *process* can one reach *understanding* of the resulting knowledge. It is in the process that questions such as "What is the evidence for ...?" and "Why do I believe ...?" get asked. If knowledge is passed on as a ready-made, finished product without reference to how it was developed, there is no way to judge its validity—astronomy and astrology, for example, or evolution and creation become equally acceptable. Shifting the emphasis from acquiring information to improving process skills is as much a need today as in Dewey's time, and museums are well suited to take up that challenge.

On top of the compelling educational reasons for focusing on *process*, a bonus for museums comes from the intrinsic reward visitors get from reaching understanding through their own inquiry. Often called the "ah-ha" experience, it is so strong and satisfying that it provides powerful motivation for continued inquiry—sometimes for a lifetime. This is the "fun," in a deeper sense, that draws people to museums and keeps them coming back.

Process as a Goal

We humans tend to be goal oriented. That is, we have something in mind that we want to attain, and then we do what it takes to achieve it. The process we employ is simply a means to the desired end, and the less effort we expend the better. But there are situations where achieving the stated goal is not the real reason we participate in the activity. In golf, for example, the ostensible goal is to get the ball into the cup. But if this were the real goal, you would simply pick the ball up, walk over to the cup, and drop it in; you wouldn't waste time whacking at it with a club. Or in doing a crossword puzzle, the ostensible goal is to fill in the blank spaces, but once that is attained the paper is thrown away. In these, and in many other activities, the reason we perform the activity is not to attain the final result, but to engage in the process itself. The process is not just a means to the end, *it is the end*. The final result serves to motivate and focus the process, but it may have little other value of its own.

Similarly, in museums as well as in schools, exhibit and curriculum goals have usually been stated as “learning outcomes,” often in terms of specific knowledge to be attained. But by putting the focus on outcome goals, the process is subordinated to just a “means to the end,” with the less effort expended the better. Like a golfer who finds that dropping the ball in the cup is easier than hitting it in, why make the effort to think when you can read the answer in the textbook or label; why wrestle with understanding a concept when you can simply memorize the words and recall them on a test? The true goal—to have visitors or students engage in inquiry, to gain skills and attain understanding—is undermined or totally missed.

If visitor engagement in the process is what a museum truly wants, then that is where the focus has to be—on what is actually being done at the time it is being done. *Process* needs to be embraced as an explicit goal—no longer just the means to some other end, but something to be pursued in its own right.

Mixed Goals and Methods

At the risk of oversimplifying, there are two basic approaches to educational exhibits—experience-based and information-based—and a visitor’s own thinking enters these in quite different ways.

In the *experience-based* approach, the basic method is to make authentic objects, images, or phenomena accessible for visitor exploration and inquiry. The primary goal is to engage visitors in interaction with the exhibit—the back-and-forth sequence between themselves and the exhibit which, consciously or not, involves skills such as observing, forming hypothesis, and experimenting.³ The visitor’s *thinking* is what connects one step of the sequence to the next; it is integral to the processes of exploration and inquiry and is what drives the process forward. Labels or other media in the exhibit serve to support the engagement. The quality of the engagement can be judged on the basis of what a visitor actually sees and does; by no means are all experience-based exhibits of equal educative value.⁴

In the *information-based* approach, the basic method is to present information verbally through labels or other media while the physical exhibit serves as an attractor to the label or an illustrative example for the label. The primary goal is for visitors to acquire information and factual knowledge. Thinking takes place here when visitors work at *understanding* the information. As Dewey observed: “Information is an undigested burden unless it is understood. It is *knowledge* only as its material is *comprehended* ... a result that is attained only ... by constant reflection upon the meaning of what is studied.” (Dewey, 1933) While the information a visitor retains is relatively easy to assess, the thinking

and understanding that accompany it are less so. The most common failing is that, since thinking is optional, visitors take in the information, but make no effort to understand it. As in the schools, the memorized information is then often mistaken for cognitive gain.

The two goals—engaging in inquiry and acquiring information—may both seem desirable and worth pursuing, but the two *methods* are fundamentally different, and when they are mixed, rather than delivering the best outcomes of each, the two approaches interfere with each other.

Interference Between Experience- and Information-based Approaches

Of the two approaches, *experience-based* is clearly the one that can actually engage visitors in the processes of exploration and inquiry. And since a unique strength of museums is in presenting objects and phenomena with which visitors can interact, adopting this approach and goal would seem a natural fit. But museums also feel under pressure to include *information* in exhibits. As educational institutions, they need to show measurable “learning” as an outcome for visitors, and, as in the schools, that almost always means testing for retained information. In addition, curatorial staff often see their role as communicating their expert knowledge to the public. As a result most museums end up with some kind of combination of the two goals and the two methods—they make objects and phenomena accessible for exploration and they use labels or other media to communicate information. Unfortunately, the visitor who both explores the exhibit and tries to understand the labels may find them negating each other.

One aspect of this interference is psychological; visitors may feel judged or intimidated. For most people, proceeding with their own inquiry requires encouragement. It is not something schools promote, and many visitors will have little experience to draw on or confidence in their abilities. The best encouragement is satisfying feedback from the exhibit or from skillful staff or other visitors. However, if signage presents information that appears to visitors to be the “correct answer,” that can discourage them from pursuing their own answers. The engagement becomes “what am I *supposed* to see” rather than “what *do* I see.” If their own understandings do not match the “correct” ones, visitors may feel judged as being “wrong.” Indeed, in these situations, visitors *can* feel they have “flunked” museum; the information goal has trumped the process goal.

A more pedagogical factor is that exploration and inquiry can only take place at the visitor’s own level, whereas the information is often presented more at the level of the expert. The result is that the information is not understood and does not support the visitor’s own

process. Dewey (1933) recognized this feature of experience-based education: *The only way in which a person can reach ability to make accurate definitions, penetrating classifications, and comprehensive generalizations is by thinking alertly and carefully on his own present level. ... But the organization need not be that which would satisfy the mature expert. ... It is absurd to suppose that the beginner can commence where the adept stops.*

For example, an exhibit with balls rolling along roller coaster tracks may have labels that talk about *kinetic and potential energy*; an exhibit with a beach ball held aloft in a stream of air may have a label that talks about *Bernoulli's Principle*; an exhibit where a visitor stands on a rotating platform and moves barbells in and out may have a label that talks about *angular momentum*. In each case the museum is attempting to teach the principle, but there is a large gap between the visitor's activity and the label content. The scientific principles are abstractions that cannot be seen in the exhibit; there is considerable experience and intellectual process distancing them from the visitor's own thinking. For most visitors at these exhibits their own thinking might be more like: how high do I have to start the ball to get it over the next hump; will the ball fall down if I tip the air blower too far; this reminds me of ice skaters twirling around; etc. At that level there is a great deal that can be directly explored and understood, providing much satisfaction for the visitor. The exhibit signage and human interaction should reinforce that, taking care that these genuine explorations do not get trampled in a rush to the "real" science.⁵

This does not apply just to science centers, but to museums of all types. The art curator's expertly written label may be just as far removed from the reactions, thoughts, and emotions of the average visitor and have the same negative impact.⁶

Recognizing these possible conflicts does not mean all information must be eliminated from experience-based exhibits, but it now plays a fundamentally different role. Information is presented in order to support the visitor's inquiry; it is not there to be learned as a separate, competing goal. Dewey (1933) made this same point: *Thinking cannot, of course, go on in a vacuum; suggestions and inferences can occur only to a mind that possesses information as to matters of fact. But there is all the difference in the world whether the acquisition of information is treated as an end in itself, or is made an integral portion of the training of thought.*

The conclusion here is that if museums are to truly embrace the engagement process as an exhibit goal, they have to be consistent in using the experience-based exhibit method. And that implies that they have to

either let go of the goal of cognitive learning or considerably modify it. For a number of reasons this is difficult for many museums to do.

Letting go of Knowledge

How can a museum that calls itself an educational institution possibly let go of transmitting knowledge as a goal? After all, knowledge *is* important, it is not like the artificial goal of some game. But the suggestion here is not for museums to renounce knowledge, but only to let go of it as a separate exhibit goal and instead to see it as one possible outcome of the primary goal of engaging visitors. That may still be difficult, but three insights may make it a more palatable option.

The most important insight, I believe, is that knowledge itself is never the final goal; *understanding* is the final goal. By one definition *science* is a method for describing and understanding our experiences with the world. Understanding, in this context, means finding regularities and relationships among our otherwise diverse bits of experience, and these eventually are expressed as the laws, principles, and theories of science. These principles are not of value in themselves, however, but only as they embody that understanding. Science is a rigorous form of experience-based learning, but the same ideas apply to experience-based learning at all levels, including at exhibits. A visitor's exploration and inquiry proceeds through a cycle of seeing and doing something, thinking about it, and then returning to the exhibit with increased understanding or further questions to continue the cycle. The result is increased understanding of the experience, and any knowledge acquired from "outside" is of value only as it contributes to that. If engagement with the exhibit leads to a label containing higher-level information that does *not* lead to better understanding of the exhibit, that will be a dead end for the inquiry cycle.

Some knowledge is important, of course, for various people in various situations, but in many instances it is not as important as we like to think—that is, it does not make much difference whether we know it or not. For example, it does not make much difference in most people's lives whether they believe the earth is round or flat—in fact most of us operate daily from a flat-earth perspective. It does not even make much difference whether people believe humans were created in their present form or evolved to it—neither changes what we are here and now. As put forth earlier, what does make a difference is the *process* by which people arrive at their beliefs, because that forms the basis of their *understanding* and provides insight into *why* they believe. One way for a museum to judge the importance of a given piece of knowledge it is considering including in an exhibit is simply to pay attention to the typical student's question: "Why do we have to learn this?"

There also may be concern that if the museum focuses on process and lets go of knowledge, some visitors may walk away with *misconceptions*. Actually, quite the opposite, focusing on process is the way to deal with so-called misconceptions. That term is usually applied to situations where the individual's concept differs from the generally accepted concept. But as ample experience shows, you can't change people's "incorrect" beliefs simply by telling them the "correct" concept. What is needed is to look at the process by which the visitor arrived at that concept—what experiences and observations he or she is working with and what thought processes are being applied—and then guide them to improve that process. In some cases the "misconception" may actually be a correct conception, but one based on limited experience. For example, believing in a flat earth is a correct conception within limits, and in this regard it is no more incorrect than believing in Newtonian mechanics. If you want to change these limited conceptions, you first need to widen the experience base beyond the previous limits—which is part of process. On the other hand, some "misconceptions" may actually be incorrect, the result of errors made in applying the process skills—in observing, measuring, inductive and deductive thinking (including mathematics), etc. Again, the remedy is not to try to change the conclusion, but to improve the skills and correct the mistakes—again focusing on the process.

None of this is meant to suggest that outcomes—what a visitor takes away from the museum—are no longer of interest or importance. Quite the contrary, but it is now recognized that the outcomes are integrally connected to the engagement process. Indeed it is those possible outcomes that in part determine which exhibits are of value to present. Outcomes may be of a wide variety, including attained knowledge as well as changed feelings and satisfied curiosity, but they will not be the same for any two visitors and they will be at the visitors own level. The outcomes are not the primary goal, but the byproducts of engaging in the process. It is when specific knowledge outcomes are set as a separate goal to be met by transmitting information that a conflict with the visitor's own processes occurs.

Implications for Practice

For museums that do decide to elevate the engagement process to a goal and be consistent in the experience-based approach, there are a number of suggestions that may help make this shift successful.

Perhaps the most important is that visitors' expectations, as well as the museum's, must be changed to align with the new goal.⁷ Browsing, exploring to satisfy curiosity, playful interacting, and solving puzzles, for example, should all be encouraged in their own right. Particular care must be taken that labels and

floor staff do not subtly undermine the visitor's inquiry by implying specific learning outcomes should be reached. If the expectation remains that visitors will "learn" from the exhibit, frustration is bound to occur: museum staff may be disappointed that visitors are "just playing", visitors may have an engaging experience only to end up with "so what?"

Russell presents a number of suggestions for how museums can support *thinking*, all of which apply as well to the broader goal of supporting the inquiry process. Particularly important is his recognition that thinking is an *activity*—something visitors actually *do*—and that the appropriate method to support that is *coaching*, which includes modeling, providing feedback, and practice.⁸ Museums may be limited, because of time, facility, and staff constraints, in how much practice they can provide, but they can provide feedback and, especially, modeling. Modeling—the opportunity to watch someone actually engaging in inquiry—is almost totally absent in the schools and everyday life, and it is an area where museums can play a significant role. Live demonstrations and theater productions, which most science centers present, can be scripted as models of inquiry.⁹

Exhibits need to be developed with the background and skills of the visitors in mind. This sounds like what is usually done through front-end visitor studies, but now the emphasis is on what incoming visitors will be able to *do* as much as on what they know. For example, if an ammeter is part of an exhibit dealing with electricity, will visitors be able to correctly interpret the needle movement as an indication of a flow of electricity.

The focus for exhibit developers needs to be on the sequence of things visitors will be able to *see and do* rather than on what they hope visitors will *learn*. The ideal is that visitors will be able to engage in an ongoing inquiry cycle and derive meaning *directly* from their own observations, with successive cycles leading to deeper understanding. Creating this kind of rich experience is, of course, easier said than done, but having clear goals at the outset is essential.

A final caution is how the exhibit is evaluated. If engaging in process is the goal, then that is what needs to be evaluated. Measuring a learning outcome and claiming it as evidence of engagement is not sufficient and may, in fact, undermine the process goal. The evaluation question must be "What did you *see and do*?" not "What did you *learn*?" And, if desired, that can be followed up with "What did you *think or feel*?" Clearly, if you "evaluated" only whether or not the golf ball entered the cup, you would learn nothing about the quality of the strokes (or whatever method was used) that got it there.

Conclusion

The unique appeal of museums is based on the objects and phenomena they make accessible. Visitors derive enjoyment and satisfaction from their interaction with these, from the *process* of their exploration and inquiry. What has not always been recognized is that it is also in this *process* that the greatest educational value of the museum lies. Overwhelmingly, however, for society at large as well as the schools, educational value has come to be equated with information content, and going along with this, almost all museums have adopted the transmission of information as their primary measure of educational success. Museums may try to do both—encourage the visitors' own inquiry *and* transmit information to them—but the different exhibit approaches used for the two goals end up interfering with each other. To better achieve the one goal, museums have to let go of the other. As Dewey said, *process* precedes *product* both in order of time and importance, and that is the reason for museums to rethink their goals and put *process* first.

Postscript

Since my completing this article, the Exploratorium's, *Fostering Active Prolonged Engagement: The Art of Creating APE Exhibits*, (Humphrey and Gutwill, 2005) has been published, strongly complementing the present article. It presents the results of a project to develop exhibits that "shift the role of the visitor from that of recipient of instructions and explanations to that of participant," exhibits that are defined "in terms of visitors' meaningful interactions rather than in terms of increases in their canonical knowledge." So while the present article gives a rationale for "putting *process* first" and exhorts museums to do so, the Exploratorium's book presents case histories where this has been put into actual practice. It is highly recommended reading for anyone interested in developing this kind of exhibit on their own.

Notes

1. The term *mental processing* is meant to be quite general, including all that the brain does after sensory input has been received. So it can include generating feelings and emotions as well as conscious and unconscious thinking.
2. The application of John Dewey's experience-based education ideas to museums was explored in Ansbacher, 1998. Key aspects of his approach to science education were presented in Ansbacher, 1999a. George Hein, 2004, has written about John Dewey and museum education

3. *Interact* as used here is broader than the narrow use of the term now generally taken to mean a physical manipulation of the exhibit. Interaction also can take place through observation alone, as in contemplating a work of art or studying plastinated human bodies. As used here, *interaction* and *engagement* are really synonymous terms.

4. Analyzing the quality of experience-based exhibits by examining the detailed steps of the visitor's interaction has been described in other articles: Ansbacher, 1999b and 2002. Extensive studies at the Exploratorium on maximizing visitor engagement with experience-based exhibits are reported in Allen, 2004, and Humphrey and Gutwill, 2005.

5. Although she come to it from a somewhat different perspective, Beverly Serrell, 1996, similarly recommends that labels be "well integrated with the things that visitors can see and do, respond to visitors' most immediate questions, or ask questions visitors can answer through their own observations and experiences."

6. A recent article, Clarkson and Worts, 2005, describes what I would call an experience-based approach to art. They mention early resistance to the project from curators, whose concerns were allayed by assuring them that "expert interpretations of artworks are not threatened by the idiosyncratic meanings created by viewers"

7. Tom Hennes, 2002, has made a similar point about bringing the purposes of the museum and the visitor into closer alignment—primarily by the museum shifting away from "knowledge taxonomies" and getting closer to the visitor's self-motivated activities.

8. Coaching as a pedagogic method—what it is, when to use it, and how it complements other teaching approaches—has been described by Mortimer Adler in *The Paideia Proposal*, 1982.

9. The most outstanding example of inquiry modeling I know of was Bob Miller's "Image Walk" at the Exploratorium. He recreated his own inquiry process, which took him from sun and shadows under trees to sophisticated understanding of pinhole images and lenses, with an enthusiasm that swept visitors along with him. This was written up and published in *Exploratorium Quarterly*, Winter 1987, but is unfortunately, as far as I know, no longer available.

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