Learning from Museums: An Introduction

The idea that knowledge is essentially book learning seems to be a very modern view, probably derived from the mediaeval distinctions between cleric and layman, with additional emphasis provided by the literary character of the rather fantastic humanism of the sixteenth century. The original and natural idea of knowledge is that of "cunning" or the possession of wits. Odysseus is the original type of thinker, a man of many ideas who could overcome the Cyclops and achieve a significant triumph of mind over matter. Knowledge is thus a capacity for overcoming the difficulties of life and achieving success in this world.

—G. S. Brett, *Psychology Ancient and Modern*

Beware stories that dissolve all complexity.
—David Shenk, *Data Smog*

As America and the rest of the world transition from an industrial to a knowledge-based economy, knowledge and meaning-making more than ever before become key to social and economic well-being. Even though the quantity of information grows exponentially all around us, our thirst for knowledge, for meaning-making, remains unsatisfied. Much as an individual on a life raft in the middle of the ocean says, "Water, water everywhere, but not a drop to drink," so too do we find it difficult to become "knowledgeable and satisfied meaning-makers" despite a glut of information. Where can a knowledge-thirsty public turn for learning? There are books. Despite the hype about declining literacy, the number of books sold per year is at an all-time high. There is television. Not only is
television viewing up, but so too is the amount and diversity of information-oriented programming. There is the staggering growth of the Internet, a fact of which we are all aware. And, yes, there are museums! Museums—art, history, natural history, and science museums; zoos and aquariums; botanical gardens and arboretums; and historical sites—are tried-and-true sources of understandable information, places one can trust to provide reliable, authentic, and comprehensible presentations of art, history, natural history, and science objects and ideas. They are places that both children and adults can leisurely browse to discover the past, present, and future of humanity, the natural world, and the cosmos, where the public can seek and find meaning and connection. In large part as a result of this classic convergence between ever rising popular demand (the public's desire for knowledge and meaning-making), and a reliable and trusted supplier (institutions capable of presenting ideas to the public in enjoyable and comprehensible experiential formats), museums of all types have been enjoying unprecedented popularity and growth.

Let us put these changes in perspective. Thirty years ago only about one in ten Americans went to museums with any regularity. Ten to fifteen years ago that number had increased to nearly one in four. Today, depending upon which statistic you believe, somewhere between two and three out of every five Americans visit a museum at least once a year. This number is likely to continue to increase so that, if not already, soon the majority of Americans will visit some kind of museum at least once a year. Although museums have clearly changed what and how they present objects, ideas, and information, as well as the types of exhibitions and programs they present, the change has not been so dramatic as to totally explain this explosion in popularity. This change suggests a fundamental shift in the public's values and priorities relative to museums, a change in the public's perceptions of the role museums can play in their lives. Whereas as recently as twenty years ago museums were widely considered dusty anachronisms, today they enjoy a high level of public awareness and prestige. It was not so long ago that the vast majority of Americans would rather have been bound and gagged than visit a museum. Today museums rank along with shopping and sports as one of the most popular out-of-home leisure experiences in America. Doubtless, the causes for this sudden shift in appreciation and popularity in museums are many, but we would argue that at the core there is but one thing—learning. Learning is the reason people go to museums, and learning is the primary "good" that visitors to museums derive from their experience. In large part corresponding to both of these realities, the museum community currently justifies and boldly promotes itself as a bedrock member of the learning community. Yet many inside and outside the museum community privately, and sometimes publicly, question whether any real learning occurs in museums. Do visitors to museums learn, and if so, how do they learn and what do they learn? This book intends to answer these questions. However, as we will soon make clear, the answers are neither simple nor easily investigated. Unlike only a few short years ago, though, they are now answerable.

LOOKING AT SOME OF THE DATA

The place to start, or so it would seem, is with the museum experience itself, where the proverbial rubber meets the road: the exhibition or program. The prevailing model for understanding learning in museums runs something like the following: Visitors come to museums, look at exhibitions, or participate in programs, and if the exhibitions or programs are good, the visitors learn what the project team intended. This seems simple enough. You create a quality educational exhibition or experience, add visitors, and, voila, you get learning! Informed project teams have even expanded their notions of learning to include a host of previously excluded dimensions, including changes in attitudes, aesthetic appreciation, and family communication, to name a few. But is it that simple? Let's follow two visitors whom we observed as part of a research effort at the Smithsonian's National Museum of Natural History explicitly designed to test our assumptions about museum-based learning and see whether this traditional model seems to explain what is going on.

Two women in their late twenties enter the Museum of Natural History on a Sunday morning in early fall. They begin by walking up to the elephant in the rotunda. After a brief pause there, they obtain a map at the information desk and head for the dinosaur and paleontology exhibitions. They quickly make their way around the dinosaur exhibitions, stopping occasionally to read a few labels here and there. For example, one of them seems particularly interested in the head of the Triceratops. After about ten minutes they exit again by way of the rotunda and, checking their maps, head down the escalator to a temporary exhibition on spiders. They spend about fifteen minutes in Spiders. Sometimes they watch other groups interacting with exhibits, and sometimes they interact with exhibits themselves. Most of the time, the two women stay together and look at the same exhibits; occasionally they drift apart and look at exhibits separately. Next they go back up the escalator and walk through the other
temporary exhibition at the museum, Ocean Planet. This exhibition they view at about the same pace as Spiders; total time in the exhibition is also about fifteen minutes. Next they briskly walk through the various vertebrate exhibits on birds, mammals, and amphibians, briefly pausing at a few scattered exhibits but never for more than a few seconds. They take the elevator up to the second floor and very quickly walk through the Geology, Gems and Minerals, and Insect Zoo exhibitions. Ninety minutes after entering the museum, they are ready to leave.

Before they leave, we conduct an open-ended interview, inquiring about why they had visited, what they had discovered that was new to them, what they had found interesting, and a whole series of other questions designed to understand their personal experience within the museum. One of the women chooses to talk about the Spiders exhibition and the Insect Zoo. She says the Insect Zoo was her favorite exhibition area. When asked why, she says, “Just because of the way it was set up. There was a lot of interactive stuff, and I liked how the designs kind of incorporated the walls . . . and cages.” The other woman says her favorite exhibit was Ocean Planet; however, she finds it difficult to give a specific reason other than saying, “Conserving the ocean is important.” When questioned further, each is able to give one or two specific examples of new tidbits of information they learned. For example, one comments on how surprised she was at the diversity of spiders and how interesting some of their webs were. She also volunteers a comment on the dinosaur exhibition, saying she had learned about the shapes of some of the aquatic dinosaurs. When probed about the Triceratops, she says she really found the size of it remarkable. The other woman mentions that she enjoyed all the exhibitions and thought that the quality of the displays was quite good. Other than these few comments, neither woman has too much to report. The only mention made of any of the exhibitions seen in the last half of their visit, the period when they were “skating” through the museum, was the one woman’s comments about the design quality of the Insect Zoo.

So, what did these women learn? If you are an optimist, you might conclude that they clearly came away with a greater appreciation of spiders, their variety and adaptability (although they didn’t exactly say this, it could be inferred); at least one also seemed to have a richer sense of the size and diversity of dinosaurs. Also, one of the women seemed to have her commitment to ocean conservation reinforced. If a pessimist, you would be justified in concluding that these two women learned precious little in their ninety-minute visit.

However, this is not the end of the story. Five months later we telephoned each of these two women, and among other things, we asked them if they had thought about their trip to the National Museum of Natural History at all since their visit. We asked whether they had discussed their visit with anyone or whether any event had made them aware of something they had seen or done while at the museum. One of the women said that the part of her Washington trip she mentioned to her family was the time she spent in the museums, “because we spent most of our time there.” She was bubbling over with enthusiasm about her trip, in general, and her visit to the Museum of Natural History, in particular. She mostly described the Spiders exhibition and the Insect Zoo and its impressive design. She reiterated what she had said immediately after her visit, that the Insect Zoo had really good displays and interactives for kids and adults and was colorful and interesting. In detail, she went on to describe several of the exhibits in both the Spiders and Insect Zoo areas, recalling what they looked like, how she interacted with them, and what she remembered about their messages. She described in much more detail than immediately after her visit ideas and facts she learned. For example, she said that since seeing the Spiders exhibit, she was more aware of the types of spiders that live in her community, such as the brown recluse. She said she had never realized that there were poisonous spiders living in her hometown. As she thought about it more, she said she thought she might have mentioned to someone that there are poisonous spiders in her community, but she was not sure. This latter recollection came up in conversation when she noted that she was currently working on editing a new textbook (she works as a school textbook editor) that included chapters on insects and spiders. She said that she found her natural history museum experience useful for this chapter and that it may have been in the context of that project that she mentioned what she learned to a coworker.

She also remembered telling her parents about the architecture of the building, because it was so distinctive. She was particularly struck by the size of the dome and the impressive inlays on the floor and ceiling. She also recalled telling her family that she thought the animals and dinosaurs were more interesting than the gems. She could not remember if she mentioned the Museum of Natural History specifically to anyone after her visit, just the Smithsonian museums, in general. She said she talked to people a lot about the Holocaust Museum, primarily because it was new: “It was the highlight . . . I mean, not the highlight [in terms of it being uplifting], but . . . [a highlight in terms of it having made the strongest impact on me].” She found it to be depressing, but interesting and well done. 

As she talked more about the National Museum of Natural History, she said she remembered the elephant at the entrance to the museum and that...
it reminded her of the elephants at the Field Museum of Natural History in Chicago, where she lives. She wondered whether all natural history museums have elephants in the entrance.

Then she launched into another story she felt related to her trip to the museum. She indicated that when she went to visit her parents, who had recently moved to Michigan, she had seen black squirrels there. When she saw them, she said, she remembered having seen an exhibit about albinism and melanism in squirrels at the Museum of Natural History. She said she remembered wondering whether the Michigan squirrels were an example of melanism but said she was not sure that they really were. She concluded by saying she had been to the museum before, so she knew it would be interesting. Since she is “into science,” she wanted to see what was new at the museum since her last visit and so was particularly interested in new aspects of the museum, such as the Spiders and Insect Zoo exhibitions.

In contrast to the first, the second woman said that she had visited many museums and learned a lot, but nothing stood out in her mind several months later specifically about the Museum of Natural History. She could remember a few assorted details about the museum—for example, that she saw an exhibition on spiders, that her friend was really excited about the Insect Zoo, and that generally she saw lots and lots of rocks and bones.

The only exception to her general lack of recall related to a book she was reading. She said she was reminded recently of the Museum of Natural History when reading a popular novel about amphibians (Tom Robbins’s Asleep in Frog Pajamas). She said the book reminded her of how many different types of amphibians she had seen at the museum. She went on to say, “Having seen the Natural History Museum’s habitats and reconstructed [amphibian] environments made the book easier to picture—it is about the fictional lifestyle of amphibians.” She said that although she is trained in art, “I enjoyed [the Museum of Natural History] anyway. . . . I liked the variety of the trip.”

The second woman went on to describe how she and her friend had also visited art museums during their visit, for example, the National Gallery of Art, which she said she enjoyed more than the Museum of Natural History. She proceeded to describe a number of the paintings she had seen, discussing some of her favorite pieces of art and artists at length (e.g., Picasso, Braque, and Cézanne). She said she enjoyed the exhibitions she saw at the natural history museum because they “reinforced her knowledge.” But she said that while she was not sure she learned that much new, it was wonderful to see things that made “real for her” things she already knew. She compared the museum to watching TV nature shows, which she said she does often. She said the museum’s exhibitions and TV nature shows are similar in that they “look at one species in depth and allow you to put an image with an idea.”

**MAKING SENSE OF THE DATA**

What an amazing difference! Five months later both women seemed to have constructed additional knowledge about the experience, despite initial appearances. In particular, one of the women seemed to have come away with several new insights, a number of new ideas, and an overall renewed excitement and interest in natural history. Although her friend seemed to have found less to connect with, at least at this museum—obviously her personal interests lay in art—she too came away with a few new tools for visualizing and making more comprehensible the natural world around her. All in all, not bad for a quick ninety-minute spin through the museum! But this is not all we can learn from this example.

Equally important, and perhaps most startling, is the fact that these demographically nearly identical individuals (well-educated, professional—both children’s textbook editors—white women in their late twenties living in the same Chicago community) visited the same museum on the same day, saw the same exhibitions for exactly the same amount of time, even viewed and discussed with each other some of the same specific exhibit elements, and yet what they learned was totally different. How can this be? Certainly these data throw into question our initial museum learning model that posited that if visitors look at exhibitions or participate in programs, and if the exhibitions or programs are good, they will learn what the exhibition team intended. These data would suggest that the model, if not completely wrong, at the very least is seriously flawed. Understanding the content and quality of exhibitions and programs is necessary but not sufficient for understanding the complexity of museum learning.

As we look at the data gathered during the follow-up interview, we begin to see the important roles played by prior knowledge, interest, and the museum experience itself, as well as the unpredictable but important role of subsequent experiences, such as later seeing a black squirrel in Michigan. All these variables played major roles in affecting what these women were able to remember and what they ultimately learned. The truth of the matter is that if we had known beforehand that one of these women was a self-described “science person” and the other
an "art person," we might have better been able to predict that they would have focused on different aspects of the experience. If we had known that one of the women was a children's science textbook editor and the other a children's art textbook editor, we would have understood why they focused on different features of the museum. If we had known that this was not the first visit for one of the women but was for the other, we might have understood why they spent their time as they did. If we had known more about how this particular museum visit fit within these two women's visits to Washington, we might have better understood why they spent such a relatively small amount of time at the museum. If we had known that one of the women was only visiting this museum in deference to her friend but that shortly the roles would be reversed when they visited the National Gallery of Art, we would have better understood the differences in time, attention, and meaning-making invested in the museum by the two. Finally, we could not have known beforehand what events would transpire after the visit, but certainly we could have predicted that events would transpire and that these events would play a powerful role in what subsequently was remembered from the experience.

In short, in order to understand what these two women learned at the National Museum of Natural History on this particular Sunday morning required knowing much more about them and their visit than merely what exhibitions they visited and for how long. To the extent that we can generalize from this one example, learning from museums involves a wide variety of variables, some of which relate to the exhibitions and programs and many that do not. Why visitors come, with whom they visit and for what reasons, what they already know, what their interests are, what their prior museum experiences are, and what subsequent reinforcing events occur in their lives play as great a role in learning—if not a greater one—as anything that happens inside the museum.

At this point it is probably important to reiterate that this is real data, albeit on just two individuals from a larger study of fifty visitors. However, we are quite certain that the results would not change dramatically if we repeated this experiment with the same individuals in a different museum (for example, if we had compared these women's learning at the National Gallery of Art or the U.S. Holocaust Memorial Museum), nor would results be different with other pairs of individuals at the same museum. In fact, we have done this experiment, as have others, directly and indirectly, with hundreds if not thousands of individuals. The same thing happens. It is not that these two individuals were oddities, it is that our traditional model of learning is flawed.

Yes, people learn in museums, but over the years providing compelling evidence for museum-based learning has proved challenging. As it turns out, this is not because the evidence did not exist but because museum learning researchers and the public alike have had the wrong search image and were using flawed tools. There are many reasons for this, but the primary reason has been the strange and fundamentally erroneous way that learning has been traditionally conceptualized. Perhaps the greatest impediment to understanding the learning that occurs in museums has been that social scientists, educators, museum professionals, and the public at large have historically thought of museum learning as being similar to traditional models of learning, such as the transmission-absorption model. This line of thinking suggests that museum visitors should learn the same types of things and in the same manner as do students at school; the only major difference is that in museums people learn less. The standard museum learning paradigm described above is a good example of this; the visitors are the students and the exhibition is the lesson. Bring the students into the classroom, present them with a lesson, and they will learn it. In the case of the classroom, they will have plenty of time to absorb it all; in the case of the museum, they spend less time, so maybe they will only get the gist of the message. As we have seen, this model does not quite work in museums—and, of course, in truth, it does not quite work in schools either.

Defining learning is a tricky business. For example, learning is simultaneously a process and a product, a verb and a noun. So slippery is learning as a concept that even the social scientists that study learning for a living, such as psychologists, anthropologists, and sociologists, have difficulty agreeing on a single definition. Many of these professionals have avoided the dilemma by identifying numerous types of learning. For example, it has been argued that there is one type of learning that occurs when remembering sensory experiences and another type of higher learning that occurs under conditions of instruction such as might occur in a school classroom. Although one could find merit in such taxonomies for some purposes, for the purposes of understanding museum learning, they certainly have little value. It is better to think more holistically, to think about learning as a series of related and overlapping processes, appreciating that such systems can be difficult to make sense of because of their complexity and ephemeral nature. By analogy, it is traditional to discuss the complex and ephemeral functioning of the human body by thinking of the circulatory, respiratory, and nervous systems as separable and discrete entities. This approach has many benefits, particularly if one does not lose sight of the fact that in a fully functioning, living human,
none of these complex systems is in fact separate or discrete, nor can their individual functions be completely isolated without damaging the whole. To understand the living system, it ultimately makes more sense to talk about respiration or digestion, activities that involve many of these systems simultaneously. Similarly, there are benefits to a reductionist view of learning, as long as it is ultimately appreciated that learning in museums is a whole-body, whole-experience, whole-brain activity.

THE CONTEXTUAL MODEL OF LEARNING

To this end, eight years ago we formulated a framework for thinking about learning that tried to accommodate much of the diversity and complexity surrounding learning, a framework that we called the Interactive Experience Model. Today we have built upon and refined that model, recasting it as the Contextual Model of Learning. The Contextual Model posits that all learning is situated within a series of contexts. In other words, learning is not some abstract experience that can be isolated in a test tube or laboratory but an organic, integrated experience that happens in the real world. We argue that learning is a product of millions of years of evolution, an adaptation that permits an ongoing dialogue between the whole individual and the physical and sociocultural world he or she inhabits. The Contextual Model was derived from observations of real people in real settings, and thus it is not surprising that other thoughtful individuals, before and since, also considered models similar to this one.

The Contextual Model involves three overlapping contexts: the personal, the sociocultural, and the physical. Learning is the process/product of the interactions between these three contexts. Intentionally, this model of learning is more descriptive than predictive. The power of the Contextual Model is not that it attempts to reduce complexity to one or two simple rules but rather that it embraces and organizes complexity into a manageable and comprehensible whole. In so doing, the Contextual Model successfully accommodates much, if not most, of what is currently known about learning.

After working with this model for nearly a decade, we believe it is still reasonable but, as initially described, incomplete. Over the intervening years we have come to appreciate that the model needs a fourth dimension—time. Looking at the museum experience as a snapshot in time, even a very long snapshot (e.g., the time a visitor spends in the museum), is woefully inadequate. To understand learning, any learning, requires a longer view. It is as if you need to pan the camera back in time and space so that you can see individual learners across a larger swath of their life and can view the museum within the larger context of the community and society.

A convenient, though admittedly artificial, way to think about this model is to consider learning as being constructed over time as the individual moves through his sociocultural and physical world; over time, meaning is built up, layer upon layer. However, even this model does not quite capture the true dynamics of the process, since even the layers themselves, once created, are not static or necessarily even permanent. All the layers, particularly the earliest ones, interact and directly influence the shape and form of future layers; the learner both forms and is formed by his environment. For convenience, we have distinguished three separate contexts, but it is important to keep in mind that these contexts are not really separate, or even separable.

Western science in general and psychology in particular are strongly tied to ideas of permanence—the brain is a constant, the environment is a given, memories are permanent. None of this appears to be, in fact, reality. None of the three contexts—personal, sociocultural, or physical—is ever stable or constant. Learning, as well as its constituent pieces, is ephemeral, always changing. Ultimately, then, learning can be viewed as the never-ending integration and interaction of these three contexts over time in order to make meaning. Perhaps the best way to think of it is to view the personal context as moving through time; as it travels, it is constantly shaped and reshaped as it experiences events within the physical context, all of which are mediated by and through the sociocultural context. A valiant effort at depicting this model is shown in figure 1.1. This model really should be depicted in three dimensions and animated, so that both the temporal and the interactive nature of learning could be captured. In the absence of 3D animation, we invite you to use your imagination.

DOCUMENTING LEARNING

It is essential to document the learning that results from museum experiences. We believe that educators and psychologists, as well as policymakers and the public, have historically found this a challenging task because they have approached the problem incorrectly, quite literally asking a fundamentally flawed question. In museums and schools alike, we have framed the question as, What does an individual learn as a consequence of visiting this museum, or seeing this exhibition, or attending
people learn when they freely choose to learn. Free-choice learning tends to be nonlinear, is personally motivated, and involves considerable choice on the part of the learner as to what to learn, as well as where and when to participate in learning. This type of free-choice learning is not restricted to museums, but it is in museums that we currently best understand it. To the extent we can develop a better model of learning in museums, we, as a community, can do a better job of facilitating learning in museums and other free-choice learning settings, and a better model will also enable us to do a better job of documenting the learning that results.

The questions that many museum directors, trustees, and professionals are currently asking are: Do people actually learn as a result of museum experiences? And if so, what are they learning? We would assert that the answer to the first question is an unequivocal yes. Answering the second question is much more difficult since it requires knowing something about who is visiting, why they are visiting and with whom, what they are doing before and after the visit, what they see and do in the museum, and how all these factors interact and interrelate. The place to begin this investigation is with the fundamentals of how people learn, through an inquiry into the roles of the personal, sociocultural, and physical contexts and how these contexts interact over time and space to affect learning.

**KEY POINTS**

- Free-choice learning occurs during visits to museums, when watching television, reading a newspaper, talking with friends, attending a play, or surfing the Internet. Free-choice learning tends to be nonlinear and personally motivated and to involve considerable choice on the part of the learner as to when, where, and what to learn.

- To understand human learning, it is important to appreciate that it is the product of hundreds of millions of years of survival-oriented evolution, an adaptation enabling people to intelligently navigate an ever changing social, cultural, and physical world.

- One of the aspects of learning that makes it so challenging to understand is that it is always both a process and a product, a verb and a noun.

- The **Contextual Model of Learning** suggests that learning is influenced by three overlapping contexts: the personal, the sociocultural, and the physical. Learning can be conceptualized as the integration and interaction of these three contexts.
Chapter 1

NOTES

12. This excerpt describes the museum experience and subsequent interviews with two people who were part of a larger study of fifty visitors conducted at the National Museum of Natural History in 1994 (Falk et al. n.d.) The following methodology was employed: (1) Randomly identify individuals, either in a group or alone, as they enter the museum. (2) Conduct a brief introductory interview to know more about who the visitors are, where they come from, why they are visiting, and what they hope to see and discover. (3) After securing permission, track the visitors as unobtrusively as possible throughout their entire museum visit (including stops at the gift shop, food service, etc.), noting where they go, what they do, and, to the extent possible, what they converse about. (4) Conduct an open-ended, face-to-face postvisit interview that seeks to learn why they visited the museum, what they were interested in, and what they felt was interesting and informative during their visit. (5) Four to five months later, call individuals back and reinterview.
13. We did not pursue in any detail her memories of the Holocaust Museum or, subsequent to her friend’s memories of the National Gallery of Art.
14. This exhibit is located in the mammal exhibition hall, which is currently being redesigned, one of the areas this woman zipped through in the latter half of her visit. Note: Albinism is an absence of pigmentation that causes an animal to appear white; melanism is an abundance of pigmentation that causes an animal to appear black.
15. She was correct in thinking the black squirrels she saw were an example of animal melanism.
16. The exhibit she referred to could have been located in either the vertebrate exhibition hall or the Insect Zoo; both of these were areas this woman zipped through in the latter half of her visit.
22. See, e.g., Lewin 1951; Ceci and Roazzi 1994; Mead 1934; Shweder 1990.


The Personal Context

The history of educational theory is marked by opposition between the idea that learning is development from within and that it is formation from without.

—John Dewey, Experience and Education

Learning is a very personal experience that depends on a number of conditions for success, some within the brain and others more a function of the external environment. This reality is well illustrated by a letter written to us in 1995 by a colleague, Edward Jay Pershey, Director of Education at the Western Reserve Historical Society, Cleveland, Ohio.

I was attending the American Association of Museums’ Learning in Museums seminar in Chicago in November, 1994. During the day-long seminar the first day, a portion of the discussion centered around the idea that it is difficult to measure just what people learn while visiting the museum, since the learning is informal to begin with and may not manifest itself at some time, sometimes years. . . .

That evening I called back to my wife Monica Gordon Pershey, who is an Assistant Professor of Speech & Hearing at Cleveland State University. Her areas of interest are language and reading development in children. She started off telling me how her day went. That morning she had an appointment at a school on Cleveland’s West Side. Cleveland State and our neighborhood are on the East Side. [Cleveland’s East Side and West Side are divided by the Cuyahoga River, which runs through the industrial Flats and marks the west border for downtown.] When she went to go over to the West Side, she remembered that the high level bridge crossing the Cuyahoga Valley was under repair and closed, and so she chose to follow a route through the Flats that I had showed her a few weeks before. There are several smaller bridges, lift and swing bridges, at river level that she could cross.
8

The Contextual Model of Learning

Analysis breaks down when we are dealing with complex systems with many interactive loops. In such systems, you cannot just isolate the parts and put them back together, because in isolating the parts you change the system. The system has to be considered as a whole. So we try to use conceptual models, which are a sort of hypothesis of what may be happening.

—Edward de Bono, *Sur/Petition*

It is human nature to want simple explanations for complex reality. For example, in a book we recently read, a physician described how during his days in medical school he was constantly overwhelmed with the quantity of information. He said some teachers could package the information very simply: “Here, this is what you need to know.” Medical students loved those teachers, he said. But there were other teachers who always offered two or more (often contradictory) perspectives on things. This the students hated. “It involved more work on our part,” said the doctor. “Who wants to be told that some people think this, and some people think that? It was so much easier just to be told what is what.” But, he said, as the years went by and he became more and more experienced as a doctor, he realized that the concise, neatly packaged views were wrong. The teachers had chopped off all the rough edges that didn’t fit into the system. In the end, the simplest solutions were not always the best.

For better or for worse, we believe, learning is a phenomenon of such complexity that a truly simple model or definition will not result in a
sufficiently realistic and generalizable model. The complexities of learning can only be simplified so much before they become less than useful. Consequently, what we are proposing is not really a definition of learning but a model for thinking about learning that allows for the systematic understanding and organization of complexity. The Contextual Model of Learning is an effort to simultaneously provide a holistic picture of learning and accommodate the myriad specifics and details that give richness and authenticity to the learning process.

In this book we have focused on the learning that occurs from museums, since this focus has permitted us to make concrete and tangible that which is inherently abstract and intangible. As we have repeatedly stressed, the where and why of learning does make a difference. Although it is probably true that at some fundamental, neurological level, learning is learning, the best available evidence indicates that at the level of individuals within the real world, learning does functionally differ depending upon the conditions under which it occurs. Hence, learning in museums is different from learning in any other setting by virtue of the unique nature of the museum context. Although the overall framework we provide should work equally well across a wide range of learning situations, compulsory as well as free-choice, the specifics apply only to museums. In the final analysis, to truly understand how, why, and what people learn, specificity is essential. There is no simple, stripped-down, acontextual framework for understanding learning. Learning is situated.

Learning is a dialogue between the individual and his or her environment through time. Learning can be conceptualized as a contextually driven effort to make meaning in order to survive and prosper within the world. We have chosen to portray this contextually driven dialogue as the process/product of the interactions between an individual’s personal, sociocultural, and physical contexts. As we have stated repeatedly, none of these three contexts is ever stable; all are changing.

EIGHT KEY FACTORS THAT INFLUENCE LEARNING

The Contextual Model of Learning provides the large-scale framework within which to organize information about learning; inside the framework hang myriad details. The factors that directly and indirectly influence learning from museums probably number in the hundreds, if not thousands. Some of these factors are apparent and have been described in this book. Many other factors are either not apparent or are currently perceived by us to be less important and have not been described. However, after considering the findings from the hundreds of research studies reviewed for this book, we found that eight key factors, or more accurately suites of factors, emerged as particularly fundamental to museum learning experiences:

**Personal Context**
1. Motivation and expectations
2. Prior knowledge, interests, and beliefs
3. Choice and control

**Sociocultural Context**
4. Within-group sociocultural mediation
5. Facilitated mediation by others

**Physical Context**
6. Advance organizers and orientation
7. Design
8. Reinforcing events and experiences outside the museum

Individually and collectively, these eight factors significantly contribute to the quality of a museum experience. When any of these eight is absent, meaning-making is more difficult. Each of these factors, examined in detail in the preceding chapters, is summarized here.

**Motivation and Expectations**

People go to museums for many reasons and have predetermined expectations for their visit. These motivations and expectations directly affect what people do and learn. Usually the public’s agendas are closely matched to the realities of the museum experience, but not always. When expectations are fulfilled, learning is facilitated. When expectations are unmet, learning suffers. Intrinsically motivated learners tend to be more successful learners than those who learn because they feel they have to. Museums succeed best when they attract and reinforce intrinsically motivated individuals.
Prior Knowledge, Interests, and Beliefs

Prior knowledge, interests, and beliefs play a tremendous role in all learning; this is particularly the case in museums. By virtue of prior knowledge, interests, and beliefs, learners actively self-select whether to go to a museum or not, which type of institution to visit, what exhibitions to view or programs to participate in, and which aspects of these experiences to attend to. The meaning that is made of museum experiences is framed within, and constrained by, prior knowledge, interests, and beliefs. At a very fundamental level, in the absence of appropriate prior knowledge, interests, and beliefs, no one would ever go to museums and no one would ever learn anything there even if they did. Because of the constructed nature of learning and the heterogeneous nature of museum-visitng populations, the prior knowledge, interests, and beliefs of museum visitors vary widely across, and even within, museums. For all these reasons, learning in museums is always highly personal.

Choice and Control

Learning is at its peak when individuals can exercise choice over what and when they learn and feel that they control their own learning. Because museums are quintessential free-choice learning settings, they more often than not afford visitors abundant opportunity for both choice and control. When museums try too hard to mimic compulsory education or force specific learning agendas on the public, they undermine their own success and value as learning institutions.

Within-Group Sociocultural Mediation

The vast majority of visitors go to museums as part of social groups—groups with histories, groups that separately and collectively form communities of learners. Parents help children understand and make meaning from their experiences. Children provide a way for parents to see the world with "new" eyes. Peers build social bonds through shared experiences and knowledge. All social groups in museums utilize each other as vehicles for deciphering information, for reinforcing shared beliefs, for making meaning. Museums create unique milieus for such collaborative learning.

Facilitated Mediation by Others

Socially mediated learning in museums does not only occur within an individual’s own social group; powerful socially mediated learning can occur with strangers perceived to be knowledgeable. Such learning has long evolutionary and cultural antecedents, and few other museum experiences afford as much potential for significantly affecting visitor learning. Many such interactions occur with museum explainers, docents, guides, and performers, and they can either enhance or inhibit visitor learning experiences. When skillful, the staff of a museum can significantly facilitate visitor learning.

Orientation and Advance Organizers

Study after study has shown that people learn better when they feel secure in their surroundings and know what is expected of them. Museums tend to be large, visually and aurally novel settings. When people feel disoriented, it directly affects their ability to focus on anything else; when they feel oriented in museum spaces, the novelty enhances learning. Similarly, providing conceptual advance organizers significantly improves people’s ability to construct meaning from experiences.

Design

Whether the medium is exhibitions, programs, or web sites, learning is influenced by design. Exhibitions, in particular, are design-rich educational experiences. People go to museums to see and experience real objects, placed within appropriate environments. Two-dimensional media they can see elsewhere, computer terminals they can find elsewhere, text they can read elsewhere. Not so authentic, real “stuff” in meaningful settings. Appropriately designed exhibitions are compelling learning tools, arguably one of the best educational mediums ever devised for facilitating concrete understanding of the world.

Reinforcing Events and Experiences outside the Museum

Learning does not respect institutional boundaries. People learn by accumulating understanding over time, from many sources in many different ways. Learning from museums is no exception. The public comes
to museums with understanding, leaves (hopefully) with more, and then makes sense of this understanding as events in the world facilitate and demand. In a very real sense, the knowledge and experience gained from museums is incomplete; it requires enabling contexts to become whole. More often than not, these enabling contexts occur outside the museum walls—weeks, months, and often years later. These subsequent reinforcing events and experiences outside the museum are as critical to learning from museums as are the events inside the museum.

**UTILIZING THE CONTEXTUAL MODEL OF LEARNING: THE CASE OF BENJAMIN**

The following is an example of how this framework allows us to think about the learning that might occur for an individual visiting a museum. By necessity, our example will need to be a specific individual at a specific museum, in this case Benjamin Winthrop, a bright, engaging seven-year-old we had the pleasure of following during his visit to the Smithsonian's Natural History Museum on September 27, 1994.

**Personal Context**

Benjamin seems a bright enough child. His mother, Sophia, and sister, Jasmin, sometimes just shake their heads at the questions he comes up with. Still, it is not as if he is some kind of “genius,” they say, just a very curious and outspoken little boy. Benjamin's classmates at Martin Luther King Jr. Elementary School in Atlanta also find him to be pretty normal, even if he does ask a lot of questions in class. He enjoys playing kickball, basketball, racquetball, and baseball, gymnastics, and reading. He collects Goosebumps books and has eight or ten of them. He also likes to watch TV; his favorite shows include everything from Magic School Bus to The X Files. He also enjoys learning about dinosaurs. He owns a number of books on dinosaurs and has watched several videos on them, including Land before Time. Even in a brief conversation, it was clear that Benjamin already knew quite a bit about dinosaurs, throwing around names like Apatosaurus, Ankylosaurus, Tyrannosaurus, Miassaurus, and Stegosaurus.

This was Benjamin and Jasmin's second visit to the museum. The first time they came, the children were two and three years old. Benjamin claimed that he remembered his previous visit. According to Sophia, they had often talked as a family about this previous visit, but this time the children would be able to enjoy the museum much more because they were older. Sophia said she believed that there were a lot of interesting things for the kids to see—animals, insects, and dinosaurs, to name a few. According to Benjamin, it was strictly his mother's choice to visit the Museum of Natural History. However, he said he was really looking forward to his visit because his mother had told him there were a lot of “really cool” dinosaurs exhibited there.

**Sociocultural Context**

Benjamin entered the museum accompanied by his mother and his eight-year-old sister. As they traversed the museum, the family pretty much stuck together. Occasionally, one of the children got ahead of the others, but he or she always waited for the others to catch up.

As they walked through the museum, Benjamin mostly, but occasionally Jasmin, asked questions of their mother. The museum seemed to stimulate lots of questions for Benjamin about practically every exhibition he saw, and he directed the questions to his mother. He appeared to be on a very serious quest to soak up every detail. Sophia tried her best to answer all of Benjamin's questions. She scanned the labels for information and pulled from her own repository of knowledge. Sometimes her answers satisfied Benjamin, sometimes they just prompted more questions. He never seemed unhappy or frustrated with his mother, just very curious. One was left with the impression that this seven-year-old was trying hard to make sense of the complex information he encountered as he walked around the museum.

A significant amount of conversation and discussion ensued when the children were in the Discovery Room. Sophia would check out a discovery box, and the family would follow the directions and investigate the items. Sophia would not only follow the discovery box script but also would frequently interject her own questions. She regularly attempted to relate the contents of boxes to issues and questions specific to the family's personal experiences and interests. Benjamin's sister, Jasmin, took a much more active role in these activities than did Benjamin. While in the Discovery Room, Benjamin asked fewer questions and did less talking than while in the rest of the museum.

The museum was only moderately crowded that day, although it was a weekend. The threesome had relatively little difficulty avoiding crowds and navigated from exhibit element to exhibit element pretty much as their interest and time permitted. Although it was difficult to say for sure,
Benjamin and his family appeared to be oblivious to the other people in the museum. Once or twice, Benjamin seemed to watch other visitors, but more often the focus of his attention was on exhibitions.

Twice during the visit they stopped to ask a guard a question. Once it was to find out where the Discovery Room was located and once it was to ask where the rest rooms were. Each time the guard, first a man and then a woman, was polite and helpful, smiling and pointing out the pathway. In the Insect Zoo a volunteer was conducting a demonstration. He had large hissing cockroaches in his hands and allowed visitors to handle them. Benjamin got to hold one of the cockroaches. There was also a staff person in the Discovery Room who checked out boxes. Benjamin did not interact with this woman, but his mother did. Other than these few occasions and of course the initial conversation with us, Benjamin interacted only with his own family and seemed quite content to do so.

Physical Context

It was a beautiful fall morning the day Benjamin, Sophia, and Jasmin walked off the Washington Mall, up the granite stairs, and through the main entrance of the Museum of Natural History. Once inside, they paused as they stared at the high-ceilinged rotunda and then ahead to the large elephant. First stop was the elephant, but only briefly. Sophia then led the children over to the information kiosk, where she picked up a map. Then, guided by the map and Sophia, Benjamin and Jasmin were directed off to the right and into the Hall of Paleontology.

Thus began a very thorough, three-hour-and-forty-minute visit to the museum. By the time it was completed, the family had visited almost every gallery. In the Hall of Paleontology the family moved very slowly and carefully from one exhibit to the next, stopping to look, read labels, point, and ask questions. This pattern persisted throughout the visit to the museum, though never as much so as in the area with the dinosaurs. After paleontology they visited the Ice Age Mammals Hall then the Africa Hall. They wandered back through the cultural halls to the front of the building where they visited Mammals, Life in the Sea, Birds, the temporary exhibition Ocean Planet, and the North American Indian Halls. After asking a guard for directions, Sophia led Benjamin and his sister back to the Discovery Room. They spent half an hour in that area alone. Sophia literally had to tear the kids away. After another orientation check with a guard, the family had a rest room break and a brief lunch in the cafeteria. The family then traveled up to the second floor of the museum. On the second floor they visited the Osteology Hall, the Insect Zoo, the Geology, Gems and Minerals Hall, and the area containing South American mummies. This area, too, seemed to hold great fascination for Benjamin. After this, they traveled into the farthest reaches of the museum, into the Western Cultures Hall. The final stop for the family was on the ground floor for the new temporary exhibition on spiders. Benjamin, and to a lesser extent Jasmin and Sophia, seemed to possess boundless energy as they gleefully visited one exhibition after the next. Finally, fatigue set in, and the family mutually decided that it was time to quit and go back to their hotel.

What Benjamin Learned: The Data

As they were getting ready to leave the museum, we intercepted Benjamin and his family and conducted a brief interview. We asked Benjamin to tell us about his museum experience. We prompted him to talk to us about what he enjoyed seeing and doing and what new ideas or thoughts, if any, he had gained from his visit.

Benjamin said his favorite parts of the museum were the dinosaurs and mummies, and both he and his sister agreed that they loved the Discovery Room. Benjamin singled out for comment most of the interactive elements of the museum, for example, the Discovery Room, the Spiders exhibition, the Insect Zoo, and a video in the Western Cultures area that allowed him to choose what to see.

When asked what new ideas or things he had discovered, Benjamin talked briefly about the Triceratops skeleton, especially the fact that the head bones were thicker than he thought they would be. He also liked some of the other dinosaur skeletons, such as the Apatosaurus and the Edmontosaurus.

He mentioned how “cool” the mummy was, “all brown and creepy looking.” He said he liked all the gems in the Geology, Gems and Minerals Hall, especially the big crystals. He particularly liked one of the large quartz crystals; he said he really liked crystals. He also said that he thought the hissing cockroaches in the Insect Zoo “were really cool.” He said it was fun to be able to hold one. “But watching the black widow spider eating crickets was even more cool.” And then he stopped. It was clear Benjamin and Sophia were really tired. So we thanked them all, ended the interview, and let them go on their way.

Four months later, we telephoned the family at home in Atlanta and again interviewed Benjamin. Benjamin said that he and his family had not been to any museums as a family since their visit to the Museum of Natural History but that they had talked periodically about their visit. For example, Benjamin had studied dinosaurs in school and told his mom
how he remembered the skeletons he had seen at the museum. In particular, he mentioned the Triceratops and Apatosaurus skeletons. He went on to say that sometimes he and his mom had talked about stuff in the Discovery Room and how they got to touch and hold neat things like arrowheads and animal skulls. Benjamin told us he also remembered thinking about the Insect Zoo, specifically the beehive and the interactive exhibit that showed where in a house insects hide.

Benjamin described how, when the family went to see The Lion King for the second time, he remembered the stuffed lions at the museum. He said he was struck by the fact that the lions in the movie did not look like the real lions he had seen at the museum. He said the movie lions “were fakey, they didn’t have big enough teeth and stuff.”

As we continued talking to Benjamin, he said he remembered the dinosaur bones, “whales that were back in time,” and the live black widow spider that he saw: “It was gross. It was eating crickets, four or five of them. The crickets were dead, frozen in position about to hop.” He remembered the cafeteria and the “jewels, I mean rocks, crystals and stuff . . . Indian bow and arrows, a caveman, a cave boy that was dead and being buried . . . He was curled up.” At the museum, Benjamin said, he learned that “when a black widow [spider] gets married, she kills [the male] and eats him.” When we asked him how he learned this fact, Benjamin said his mom had told him that while they were watching the spider eat.

Benjamin told us he had gone to a natural history museum in Atlanta (Fernbank Science Center) with his class two weeks earlier. So we asked him about that trip. He said he learned about crocodiles (alligators) there that were “from eleven inches long.” Without pausing, he went on to say he recently saw a television show about snakes on Nickelodeon. Benjamin proceeded to describe in detail how a man extracted a yellowish-green venom from the snake’s fangs, dropping it into a glass. He added that he had also seen snakes at the Smithsonian. He said that he had read a book about sea turtles since his visit to the Smithsonian and thought that reptiles were pretty cool animals.

We said it sounded like his museum visit had made him think of quite a lot of things. He replied that, yes, since the visit he had thought about a number of things related to it. One of them was that he realized “why a T. rex has teeth shaped like a finger bending; because he doesn’t chew . . . he just rips and swallows.” He said he learned that during the field trip to the Fernbank museum but remembered wondering about it at the Smithsonian. At the Smithsonian natural history museum he had wanted to see sharks and also dinosaurs. He said he did not see any sharks, nor for that matter did he see a T. rex. “Do you have one?” he asked.

Once Benjamin got warmed up, his questions kept coming. He fired question after question at us: “How do they make gold into jewelry? How do they put diamonds into gold? Isn’t gold bumpy when they find it? How does it become smooth? How do horns grow out of a Triceratops’s nose? When an Ankylosaurus is about to be killed by a T. rex, does he flop down on the ground? Does T. rex get hurt when an Ankylosaurus fights back?” We did our best to provide some answers. The entire telephone conversation lasted about thirty-five minutes.

What Benjamin Learned: Our Analysis

Finally, we can ask, What did Benjamin learn from his museum experiences? At the very least, it is clear that this brief experience resulted in demonstrable, albeit modest, changes in Benjamin’s knowledge and thinking. As a direct consequence of his three-hour-plus experience at the museum Benjamin could discuss changes in interest, understanding, and knowledge; he could describe facts and ideas he experienced and relate them to pieces of knowledge gleaned from other sources. There was clear evidence that the events Benjamin experienced and the information he perceived during his Smithsonian museum visit were not only stored in memory but also retrievable, utilized, and extended subsequent to his visit. In other words, Benjamin demonstrated clear evidence of having learned.

There were aspects of Benjamin’s learning that were predictable, based upon what we knew about his expectations and interests and what was available at the museum for him to see, but much of what he seemed to take away from the experience was highly unique and extremely personal. The serendipity of what was happening at the museum that day—the hissing cockroach demonstration, a feeding black widow spider, the particular combination of exhibits he saw, and the order in which he saw them—combined with the social interaction engaged in by his mother, sister, and the Insect Zoo volunteer to become the specifics of Benjamin’s set of meanings and constructed knowledge.

He showed a preference for those exhibits that he was interested in and about which he possessed prior knowledge and experience. He particularly liked parts of the museum that enabled him to control the outcomes—for example, the interactives in the Spiders and Western Civilization halls. But Benjamin did not only respond to what he already knew. At various points in the visit he was captivated by the wonder of real
objects presented within an appropriate setting. The mummies, insects, prepared specimens, and gems created vivid, concrete images. Particularly memorable were more environmental exhibitions, the Neanderthal cave-boy burial, and the re-created house where insects hide. Throughout his visit, Benjamin was skillfully guided by his mother, who, armed with knowledge from a previous visit to the museum and a map, was able to find her way through the space. And when her sense of direction and map failed, there were helpful guards who cheerfully pointed the way. The result was an experience heightened by newness rather than blunted by strangeness.

Obviously, Benjamin’s curiosity and interest were very much central traits, as much a part of self for him as his eye color or height. A museum like the National Museum of Natural History is a veritable mother lode for the curious. The outpouring of questions four months after the experience was testimony to how rich Benjamin’s museum experience was. Without hyperbole, we can imagine him mining this experience for years to come. From his museum experience Benjamin already has constructed, and will continue to construct, concrete images about such things as the real size and shape of a lion (as compared with the animated exaggerations depicted in The Lion King), the image of a real black widow spider feeding, the size and shape of a real gold nugget as compared with the size and shape of a piece of gold jewelry, and how a real elephant tusk fits into the head of a real elephant. These visual images were richly bound to conceptual ideas, thanks in large part to his mother.

Sophia mediated Benjamin’s observations with information and ways of thinking that enabled Benjamin to develop intellectual meanings greater than any he would have been able to construct alone. For example, concepts about the mating behavior of black widow spiders became connected to the size, shape, and behavior of an actual black widow spider. In the Discovery Room, Sophia, again aided by the structure of the discovery boxes, guided Benjamin’s inquiry. One can only infer that the interesting exchange of roles between Benjamin and Jasmin in the Discovery Room (Jasmin now taking the lead) perhaps resulted from long-standing family history as well as the different learning styles of the two children. Finally, although not anticipated, the interaction with a staff person in the Insect Zoo proved both memorable and educational for Benjamin. Being singled out by an important adult and allowed to hold a precious living creature left a long-lasting impression.

By taking them there in the first place, Sophia was also modeling for both Benjamin and Jasmin the role that museums can play in their lives as places for learning. Clearly she recognized this, having taken both of the

children when they were far younger. Through this experience, Benjamin was learning a great deal about how to use museums to satisfy his many curiosities, an activity that he can enjoy throughout his life.

Benjamin did not totally rely on his mother for his learning; he also demonstrated an ability to guide his own inquiry and make his own inferences. A good example related to investigation into the growth and functioning of a Triceratops horn, based upon his careful examination of an actual fossilized Triceratops skull. Benjamin was clearly a special child, but he was not unique. He demonstrated a keen eye, an acute curiosity, and a consistent desire to make connections between things he read and heard about and the things he saw with his own eyes, connections between ideas and objects. Museums happen to be particularly good places for this activity.

Also evident from this example was the seamless, continuous nature of learning. For Benjamin, the museum experience was part of a larger continuum of experience—conversations with family, visits to other museums, television specials, books read, and classroom experiences. What Benjamin learned in one place was part of what he learned in some other place; all were intertwined—so intertwined that they challenge our abilities to reliably extract from his memories what was attributable to the museum experience and what was more appropriately attributable to some other, related experience. This is not a flaw in our approach but rather a reflection of the realities of learning.

In conclusion, the framework provided by the Contextual Model of Learning did not simplify the task of understanding what Benjamin learned, but it did provide a road map for our inquiry. The model permitted a thoughtful and reliable approach to considering the complexity and richness of the learning process without significantly compromising either precision or generalizability. It helped us focus our attention on salient parts of the data, such as the eight key factors of prior knowledge, interest, and experience; motivation and expectations; choice and control; family sociocultural mediation; the role of museum staff as facilitators of learning; orientation and advance organizers; the importance of real objects and appropriate contexts; and finally the larger community and society-wide context. In short, the model reduced the major issues to a manageable number, within a comprehensible framework, without losing sight of the inherently holistic and synergistic nature of learning. By no means complete, the three contexts we have proposed provided a starting point from which to think about how to understand free-choice learning. As this example demonstrates, museums emerge as particularly effective learning environments because they enable people to explore cultural,
aesthetic, and scientific issues perceived as important within a socially supportive, intellectually comprehensible, and contextually appropriate environment. Utilizing the Contextual Model of Learning allows us to better understand, and ultimately influence, learning in these rich environments.

KEY POINTS

Eight Key Factors That Influence Learning

Personal Context
1. Motivation and expectations
2. Prior knowledge, interests, and beliefs
3. Choice and control

Sociocultural Context
4. Within-group sociocultural mediation
5. Facilitated mediation by others

Physical Context
6. Advance organizers and orientation
7. Design
8. Reinforcing events and experiences outside the museum

NOTES

2. Benjamin’s family participated in the 1994 study at the National Museum of Natural History described in chapter 1. His name is fictitious.


9

Documenting Learning from Museums

We teach people what they almost already know.
—Tom Krakauer, “It’s Fun, but Can It Really Be Science?”

That people learn in museums is easy to state, harder to prove. Learning is such a common concept in our society that it would seem that it should be reasonably straightforward to document. However, as the preceding chapters have attempted to make clear, learning is common but definitely not straightforward, particularly if one is trying to understand and document free-choice learning. The framework provided by the Contextual Model of Learning certainly gets us closer to being able to document learning from museums by providing insights into the factors that affect the nature of such learning. In other words, it helps us know where and how to look for learning. However, it is important to appreciate that what these eight factors help us know more about is how visitors learn; they tell us relatively little about what visitors learn. It is like learning that a pregnant woman needs to have a healthy, balanced diet in order to nurture the fetus and deliver a healthy baby, truly an important and useful piece of knowledge. However, knowing that a woman had a healthy diet during pregnancy does not tell us what her infant will look like, only that her baby will more likely be born healthy. In a somewhat analogous fashion, we know that the eight factors we have described are essential for “healthy” museum learning, but they are insufficient to predict the exact “outcomes” of that learning.

Additional challenges have made it difficult to provide compelling evidence for learning from museums as well, not because the evidence does