

Interactive Learning in Museums of Art and Design

17–18 May 2002

‘The Interactive Experience: Linking Research and Practice’

Marianna Adams, Institute for Learning Innovation, Annapolis, MD
Theano Moussouri, Research Centre for Museums and Galleries, University of
Leicester

In our research and evaluation of learning in museums on both sides of the Atlantic we have noticed some common and recurring themes in the data that are important to any thoughtful exploration of visitor response to interactive experiences in museums. This paper is designed as an overview of our observations of, and conclusions from, evaluation and research of interactive spaces in different types of museums, both our own and those of our colleagues. It is an informal review of studies as they pertain to interactive spaces in art museums rather than a formal, academic review of literature or meta-study. Consequently, in the spirit of facilitating a dialogue within the field, the format of this paper is conversational, without encumbering the reader with massive citations after each point raised. A complete bibliography at the end of this paper provides information on studies used in this overview, but individual references will not be accompanied by specific citations. The organization of this paper will begin with broad issues and progressively sharpen focus to issues most pertinent to art museums as detailed below:

- First, we will briefly establish a broad-view, working definition of interactive spaces for the duration of this paper and address some of the problems connected with any efforts to define terms.
- Second, we discuss findings from research that provide insight into visitors’ attitudes and perceptions of interactive museum experiences in all types of museums and then focus a bit closer on ways in which interactive spaces in art museums are similar to and different from interactive spaces in children’s and science museums.
- Third, the focus moves more narrowly to articulate two basic models for interactive spaces in art museums.
- Fourth, a visitor-centred framework based on our experience in conducting visitor research is proposed for art museums to use as they develop interactive spaces for visitors.

Towards establishing boundaries and definitions of ‘interactive’

The term ‘interactive’ is admittedly difficult to define. Our attempt here is to discuss ways the term is used, temporarily to set the boundaries we will impose on ourselves throughout this paper and confess to the problems such efforts create. We find that the word ‘interactive’ is freely used to describe a variety of experiences in museums. Other words are often used interchangeably to refer to what most people think of as interactive experiences, but sometimes researchers and/or museum practitioners draw distinctions between the terms. Other words used are ‘hands-on/minds-on’ and ‘participatory’, and words such as ‘immersive’ are also used to refer to open-ended or virtual reality environments.

From a review of the literature it seems that the term ‘hands-on’ is used to refer to the mass of the exhibits that can be touched and manipulated. It is often used in connection to the term ‘minds-on’ to indicate that hands-on exhibits must provide something to think about as well as touch. The term ‘interactive’ emphasizes the part that visitors play in the process of ‘interaction’, although some people constrain the meaning of interactive to refer solely to computer-based experiences in the museum. The term ‘participatory’ refers to engaging visitors in a conversation with the exhibit and with other visitors. ‘Participatory’ or ‘immersive’ can be used to describe the experience that interactive works of art set up for viewers – that is, the opportunity to participate, in collaboration with the artist, in creating or changing the artwork (For more information on definitions of these terms see Lewis 1993, Gregory 1989, Williams 1990, Eason and Linn 1976, Hein 1990, pp. 24–5, Miles and Thomas 1993, Ramsay 1998 and Graham 1996).

This cluster of terms (‘interactive’, ‘hands-on/minds-on’, ‘participatory’, ‘immersive’) implies different levels or types of engagement by visitors, and good arguments could be made to draw greater distinctions among these terms within the larger umbrella concept of ‘interactivity’. The focus of this paper prevents digression into greater examination of terminology, and the term ‘interactive’ will therefore be used to refer to this family of experiences, which actively involve the visitor physically, intellectually, emotionally, and/or socially. Although research does suggest that the gradations of meaning and use of different terms is an issue for museum practitioners, it is certainly not an important issue for visitors. When there are opportunities for physical, intellectual, emotional and social engagement, visitors tend to say things such as ‘I get to do cool stuff’, ‘I get to touch things’, and ‘It’s fun!’

Hand in hand with the issue of vocabulary used to describe interactive experiences goes the fact that many different types of experiences in museums could justifiably be described as interactive, hands-on and/or participatory. For example, a traditional tour might involve docents and visitors in open-ended dialogue or provide opportunities for visitors to touch examples of different materials or examine artists’ tools. Additionally, a museum’s website or random access mobile wireless devices used in the gallery could also qualify as an interactive experience. Because the focus of this conference is on interpretation that is designed as an integral part of gallery displays or in separate areas, this paper will draw on research conducted into these dedicated spaces or on components within an art exhibition, augmented by findings in science and children’s museums. Certainly many of these research findings may have relevance to the wider range of interactive experiences in art museums.

Just this small foray into setting boundaries and a definition for interactivity presents problems. It is a discussion that needs to continue in the field at large. As we move to greater consensus on terms we will concurrently push ourselves to deeper thinking about the outcomes of interactive experiences and towards a greater understanding of how visitors learn in these spaces.

What are visitors’ attitudes towards, interest in and perception of interactive experiences in all types of museums?

The largest body of research into interactive spaces comes from science and children's museums, but the few studies that have been done in art museums suggest some

important similarities to the findings in other types of museums. There are three main themes that we have noticed in the research. First, museum visitors value interactive experiences that enable them to engage in genuine exploration, follow their own interests and facilitate social interaction. Second, interactive spaces in art museums can help break down public perceptions of the art museum as an élitist and family-unfriendly institution. Third, engagement in interactive spaces over time provides visitors of all ages with inquiry and looking skills needed to have their own dialogue with objects of art.

Visitors value interactive museum experiences

In a study by Moussouri conducted in interactive exhibitions in museums in the UK, visitors were asked to describe their experience in interactive museums or exhibitions as compared with their experience in traditional museums. The main aim of this study was to examine the agenda of family groups visiting interactive museums. Families were interviewed in the groups in which they visited about their motivation for visiting, their visit plans and their experience during the visit. Their museum experience seemed to be influenced by the family agenda for the visit and the physical context of the exhibitions visited, which consisted of interactive exhibits. Three museums or exhibitions within museums were used as case studies: Eureka! The Museum for Children in Halifax; the Archaeological Resource Centre (ARC) in York; and the Xperiment! Gallery at the Museum of Science and Industry in Manchester. From a comparison of the findings we were able to identify common themes in family visitors’ perceptions of interactive spaces between the three museums. Table 1 presents adult and child visitors’ ideas about interactive and traditional museums with static displays using their own terms.

Interactive	Non-interactive
Exciting, enjoyable Interesting way to demonstrate things Colourful Touch, feel, hold, handle Get involved, participate	Boring Keep off Look-but-don’t-touch Nothing to do
Explore and play Experiment Use all senses Explainers (social interaction)	Passive Look, read Labels
Appreciate, think, understand Get an insight More educational, easier to learn Learn more and in different ways	Cannot absorb anything
Aimed at children Exhibits are unbreakable Children are safe here Freedom of movement Relaxing	Adult-centred Keep an eye on the children Afraid of breaking things (behavioural & physical constraints)
Time flies (flow) Stay longer Remember (long-term effect)	Get in, get out

Table 1. Visitors' ideas about interactive and non-interactive museums

A large number of visitors at Eureka! and the ARC thought that interactive museums were unique places. Eureka! seemed to be very successful at introducing abstract concepts, starting with familiar/everyday objects that people could relate to. Visitors at the ARC felt that it was a special space because they could touch and examine the artefacts. This close contact with real objects made them more aware and helped them appreciate archaeology and the work archaeologists do. They felt that the ARC had given them an insight into how archaeologists reconstruct the past from the material evidence. Apart from the artefacts, visitors appreciated having explainers to interact with, as well as activities to do with their hands. One visitor said that it had a therapeutic effect on her and that she lost her sense of time in the ARC. Having had enriching personal and social experiences in the ARC seemed to reinforce visitors' interest in and commitment to archaeology. A large number of visitors mentioned that they were planning to join archaeology groups, to take relevant courses or to start collecting objects.

Commenting on both interactive and traditional exhibition spaces, a number of adults said that there is a place for both types of institution. The ideal model, however, would be to have a mixture of both approaches within the same institution. Visitors felt that the 'hands-on' approach made the subject matter of the exhibitions (science and technology, history and archaeology) accessible to people of all ages – especially children. Parents, in particular, said that they used visits to the interactive exhibitions to affect their children's learning and interest in the subject matter. They talked about the experience in terms of short-term and long-term outcomes of learning. In the short term they used interactive museums as a resource for self-directed learning and for helping their children achieve scientific literacy or learn about history and archaeology. The vast majority of the families in this study had a very strong interest in the subject matter covered by the museums visited. In the long term parents hoped that visits to interactive exhibitions would encourage their children to become scientists or archaeologists.

It is worth mentioning that interactive exhibits could communicate messages of their own, which did not relate to the messages the exhibition development team wanted to communicate. Further, visitors' own agendas and preconceptions could also affect the way they interpreted and remembered the exhibitions. The interpretation visitors provided seemed to fall into different categories, one of which referred to the interactive elements of the exhibitions. One of the themes identified by visitors to Eureka! and Xperiment, in particular, was 'how things work'. This may have been based on previous experience with interactive museum exhibitions and possibly with books on 'how things work'. It was not, however, one of the messages or the main message the museums wanted to communicate.

Interactive experiences create family-friendly environments in the museum

Research suggests that many visitors to art museums perceive that there is 'nothing to do', particularly for children/families, or that science-related museums are more interesting or fun. Many parents, as well as classroom teachers, feel they are not sufficiently informed about art to help children explore it or understand it. Research

suggests that interactive spaces help bridge this gap. Parents relax and feel equal to the task of moving through an interactive experience; they learn and feel they are also helping their children to learn.

In one study at the Speed Art Museum's interactive Art Sparks gallery in Louisville, KY, parents were not willing to take their children 'upstairs' into the 'real' museum for fear of their children misbehaving or that their children would not be interested in 'just looking'. This appears to be a stereotype that many families associate with art museums and one that museums with interactive experiences will have to overcome and change. It is important to note that the Speed study was conducted several months after the opening of the Art Sparks interactive gallery and, although it was very successful in attracting new family audiences, the staff wanted the interactive space to be an enticement to visit the permanent collections. Since the opening in 1999 two factors have contributed to changing parents' perception of the 'real' museum: the permanent collection and exhibitions. First, the education department developed Art Backpacks that could be checked out in the Art Sparks interactive gallery and provided engaging activities that families could do together in the main galleries. Families are using the backpacks with increasing frequency. Second, with repeated visits to the interactive gallery there is now evidence that, as families become more familiar over time with the museum through the interactive gallery, they become more willing to venture into the 'real' museum.



A family using Art Backpacks in the Native American Gallery at the Speed Art Museum Laramie L. Leatherman Art Sparks Gallery, Louisville, KY
Photo: Weasie Gaines

Interactive spaces can assist visitors in developing inquiry/looking skills

There was also an interesting finding in this same study regarding school students. Repeated experiences in an interactive gallery can provide a model and engage children in object-centred inquiry, and children tend to implement these looking strategies when they visit the permanent collections. The important issue in this finding is the repetition of experiences over time. Children who had visited the interactive gallery twice or more were more likely than students visiting the gallery for the first time to engage in higher-level inquiry skills (e.g., moving from simple naming and identification to comparison, analysis and interpretation) in the tour of the permanent collection. In addition, those students familiar with the interactive gallery were more likely than the first-time student visitor to remember works of art in the permanent collection, as measured by their drawings and descriptive writing a month

after their tour. It appeared that, for first-time student visitors, the interactive gallery tended to overpower the permanent collections, but this relationship was reversed after even one more visit. Other studies provide some evidence that with repeated experiences (two or more years) in multiple visit programmes involving interactive spaces, that children's critical thinking and analysis skills move from list-making and literal descriptions of objects and/or their own creative work related to those objects, to story, metaphor and meaning-making.

Are art museum interactive spaces different from those in science or children's museums?

Compared with science and children's museums, art museums have been relatively slow to incorporate interactive spaces. Separate, dedicated interactive spaces, primarily for children or families, have been present in some art museums for quite a few years but there appears to be more reticence to incorporate interactive stations within art exhibitions. Children's museums and science centres are by their very nature and original mission interactive, whereas art museums, along with history and natural history museums are artefact- or object-centred. For these museums interactive spaces are in addition to, rather than central to, the primary mission of the institution.

While many lessons can be learned from science and children's museums and applied to art interactive spaces, this fundamental difference is important. Science and children's museums essentially use interactive experiences to explain scientific concepts or phenomena. Certainly art museums wish visitors to understand and explore ideas and concepts, but the primary focus is, and arguably should be, on objects. Consequently there is an inherent tension for art museums between the 'object' and 'interactivity'. Any interactive exploration of concepts or ideas in an art museum should therefore be to further visitors' appreciation and understanding of the object, to assist them in making meaning.

There is one important similarity between interactive experiences in art museums and those in other types of museum. Interactive spaces should be an extension of the museum's mission; otherwise, they run the risk of becoming insignificant add-ons. Developing rich and meaningful interactive spaces is difficult enough. A lack of institutional commitment and of clear articulation of goals and outcomes practically dooms such efforts to failure.

Two models of art-interactive spaces

As art museums have increasingly established interactive spaces, we have noticed that there are two basic models:

- spaces that provide interactive experiences which assist visitors in the interpretation of art
- spaces that are themselves works of art, in which visitors are expected to interact on some level

Interpretation of art

As art museums began to develop interactive spaces, it was not surprising that these experiences resembled interactive science or children's museums both in appearance and in the way they operated. In dedicated spaces, frequently separated from the permanent collections/exhibitions, there are a series of components or stations that are stand-alone experiences. Some of these spaces have artworks displayed (and carefully

protected) alongside the interactive stations. Frequently these stations encourage visitors to explore ideas related to elements and principles of design (e.g., explore the use of line or shape in compositions), to experience different times or cultures (e.g., try on a piece of armour and understand something of how movement was restricted) and to play with art techniques (e.g., experiment with the different effects of watercolours and tempera paint). The energy level in this type of space can be more exuberant (noisy) because it is separate from the rest of the museum.



Visitors make connections to the museum's seventeenth-century Dutch collection at the Go Dutch! costume station at the Laramie L. Leatherman Art Sparks Interactive Gallery, Speed Art Museum Louisville, KY.
Photo: Weasie Gaines
Dutch Cut-Out: Shawn Lee
Art Sparks Design: Design in Three Dimensions, Toronto, Ontario



Ways of Seeing exhibition at the Wolverhampton Art Gallery (WAG) in West Midlands, UK. *Ways of Seeing* was mainly developed for family groups who were newcomers to the fine arts and is in accordance with the gallery's access policy. Hence over 60% of exhibitions are aimed at audiences with little or no experience with art.

Many art museums incorporate interactive spaces within selected exhibitions. This represents in many ways a cross between the science/children's museum interactive model and the reading resource centre. Because the activities are integrated into the exhibition, as in the V&A's British Galleries, the experience has to be geared to multiple ages and more thought has to be given to subduing excess noise and physical activity, since some visitors will not choose to engage with the interactive experience.



In the Family Activity area inside the *Frederick Douglass and Harriet Tubman* exhibition at the Speed Art Museum, Louisville, KY, adults and children play the Road to Freedom, a simple interactive game that uses the questions of escaping slaves on the freedom trail to exploring the imagery, emotion and meaning found in Jacob Lawrence's series on slavery and freedom.

Photo: Kenneth Hayden
 Game designer: Gwen Kelly



A docent leading a discussion of conservation techniques, processes and materials in the Gallery 12 Hands-On Gallery Space at The John and Mabel Ringling Museum of Art, Sarasota, FL. The exhibition was developed by Fayanne Hayes with Michelle Scalera and Dave Piurek.
 Photo: Jane Smith.



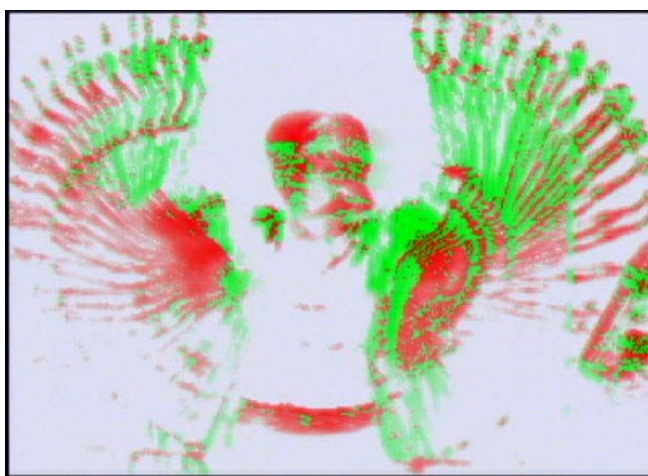
Students explore the process that artist Christy Rupp used to create her wire-framed and paper-wrapped fish, viruses and insects at Kidspace, an interactive gallery at the Massachusetts Museum of Contemporary Art (MASS MoCA) in North Adams, MA. Kidspace is a collaboration of the Williams College Museum of Art, Sterling and Francine Clark Art Institute and MASS MoCA.

Works of art as the interactive experience

Contemporary artists have increased their interest in engaging the viewer physically in their work. In some cases the viewer's involvement in a work of art is expected while in other works the viewer's involvement is necessary for the work of art to exist. Some art museums have specifically commissioned artists to develop interactive exhibitions for families and children such as the Contemporary Arts Center in Cincinnati, OH, and Kidspace at MASS MoCA in North Adams, MA.



View of *Leaf Leap* installation, September 2000–January 2001, at the UnMuseum®, an innovative interactive space at the Contemporary Arts Center in Cincinnati, OH. The floor is covered with a deep foam pad. Leaves from the USA have been enlarged to five times their real size and constructed out of fabric that reflects the color and texture of each leaf and then stuffed like pillows. The name of the leaf and geographical area where it grows is embroidered on each leaf pillow.



In *Luminous Flux*, an interactive video work by Camille Utterback, exhibited in the spring/summer 2002 installation in Kidspace at MASS MoCA, viewers move in front of the camera and the visual accumulation of their motions is projected on a screen to produce a stunning temporary outline of their body in red and green. Vertical edges are represented in green and horizontal edges in red.

As technology has become more ubiquitous in daily life, contemporary artists have explored ways to use technology as their creative medium. Some artists are exploring total immersive virtual reality environments that require visitor interaction in order to exist. Some artists have used supercomputers and fully encompassing sensory gears to create unique experiences in virtual worlds. Yet this type of virtual environment can be a physically uncomfortable (for example, it might involve wearing a cumbersome vest and helmet) as well as a socially isolated experience (since each person experiences the environment individually). To overcome these problems, a small number of artists have started using new virtual reality environments such as the CAVE. The CAVE has emerged from the University of Chicago and creates a world that can be inhabited by a group of people. Users can stand in the midst of the virtual world and interact, change or take part in creating a work of art.



Virtual Reality at the Foundation of the Hellenic World ©2000

CAVE at the Foundation of the Hellenic World in Athens, Greece. A recreation of an archaeological site at Mylitos in Asia Minor (Turkey), developed by Maria Roussou and her team in 1999. The advantage of CAVE applications in cultural institutions is that they can be experienced in social groups.



Virtual Reality at the Foundation of the Hellenic World ©2001

A school group at CAVE at the Foundation of the Hellenic World engaging in an interactive educational experience. The equipment visitors need to experience it is friendly, light and easy to use.

Both models of interactive spaces in art museums, those that interpret art and those that are themselves artworks, are viable and valuable. Each has specific advantages and each in turn presents unique problems in terms of effectiveness and logistics. As museums experiment with interactive experiences, a number of questions have arisen that the field will have to carefully address. Some of these questions are:

- What do visitors understand about the interactive experience as a work of art?
- If visitors have ‘too much fun’ is it a sign of disrespect for the art?
- How much guidance or facilitation of visitors in immersive environments is necessary and appropriate?
- What, if any, is the difference between play as learning and play as ‘fooling around’? Will being able to touch in one area of the museum put objects in exhibitions and permanent collections at risk?
- What do visitors need in the way of transition between touch and no-touch zones?

What makes a successful interactive space? The visitor’s perspective

The quality of the interactive experience, of course, determines how successful it is from the visitor's perspective. Often museum professionals and exhibition designers work in a rather hermetically sealed environment, developing interactive experiences that do not consider the visitor's needs and preferences. Repeatedly, research reveals similar findings about what visitors perceive as successful interactive experiences. Five themes emerge from the research that form a useful framework through which to plan and assess the effectiveness of an interactive space. These are: 1) multi-sensory dialogue, exploration, and discovery; 2) cultural connections; 3) empowerment; 4) uniqueness; and 5) construction of meaning.

Multi-sensory dialogue, exploration and discovery

Interactive exhibitions should engage the visitor in a multi-sensory 'conversation' on a variety of levels. They should allow the visitor to feel that he/she is 'a player in an intellectual and sensory game'. The interactive experience must draw visitors in visually and be conceptually compelling. This multi-sensory, multi-mode dialogue needs to be responsive to the human need/desire to communicate on a variety of levels.

Within this multi-sensory, multi-mode dialogue must reside a true and interesting challenge for the visitor. It must engage the visitor in real problem-solving and foster/stimulate creativity. It is important to note that visitors recognize gratuitous or superficial interactivity. This may account for some of the 'pinball' effect observed in typical interactive science centres, where children run from one station to the next pushing buttons and moving levers without focusing on the concepts. The dialogue between the visitor and the interactive experience must be perceived by the visitor as genuine, necessary and worthwhile. There needs to be a meaningful and interesting intellectual, sensory and/or social 'pay-off' for the visitor's efforts.

This multi-sensory, multi-mode dialogue seems to be very important for young children in particular. Research with families in interactive exhibitions has shown that children focus on the kinaesthetic aspect of their experience. This is such an important element of the museum visit that it affects the way it is reconstructed by children. The following drawings provide an example of how two children 'talked' about their museum visit. The drawing in Fig. 1 was made by a four-year-old boy at the ARC in York, who drew the Roman shoe that he had stitched during his visit. According to him, the zigzag lines represent the shoelace when it is tied. The next drawing (Fig. 2) represents the waterwheel exhibit at the Xperiment! Gallery in Manchester made by another boy, aged six. In his effort to show movement he also used zigzag lines where movement occurs: at the upper part and round to the right side of the drawing to depict the movement of water; and on the bottom left side of the drawing to depict the movement of his hand as he moved the handle of the waterwheel.

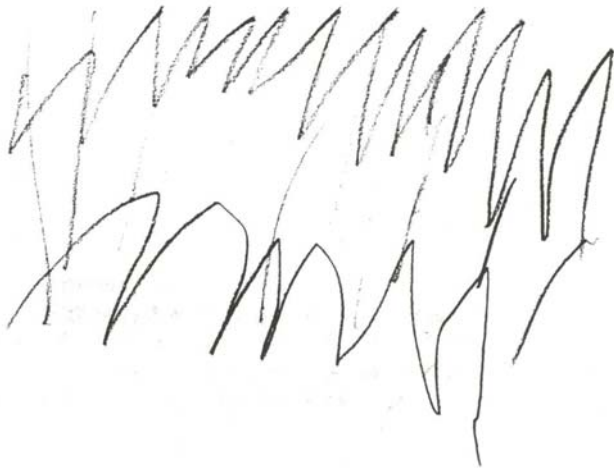


Figure 1: Four-year-old boy's drawing of the Roman shoe, with laces, in the ARC. The drawing represents an activity undertaken on the visit, where the boy stitched a replica Roman shoe and tied the shoelace. The boy described the activity while making the drawing.

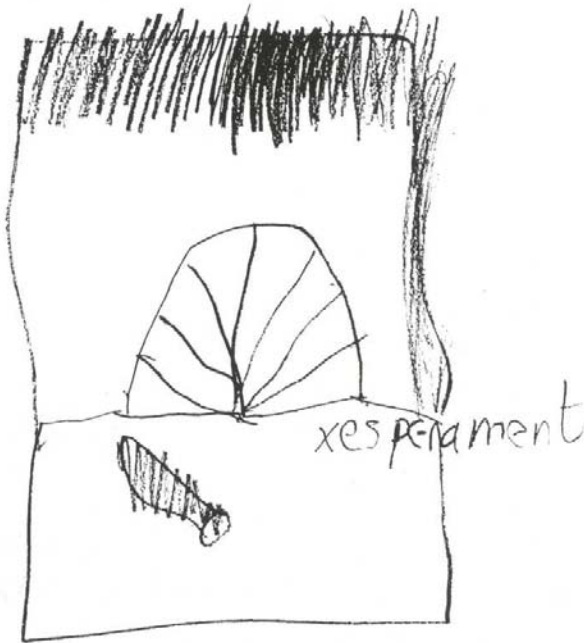


Figure 2: Seven-year-old boy's drawing of the waterwheel at Xperiment! Gallery. Visitors were asked to move the handle at the bottom left corner of the exhibit from side to side to fill the tank at the top of the exhibit with water. They could then pull the cord to release the water and observe the lamp lighting.

When exhibition developers design these multi-sensory, multi-mode interactive spaces they need, among other things, to develop a process that incorporates the way visitors learn in interactive spaces, as well as their physical, social and emotional needs during the visit. Table 2 suggests a holistic approach to the development of interactive spaces, which emphasizes striking a balance between the quality of the media in an interactive experience, and the quality of attention the visitor brings to the experience. This approach is our compilation of work by Roger Miles, former exhibition developer at the Natural History Museum in London, and Cynthia Moreno, curator of education at the Speed Art Museum in the USA. For example, a static medium might be an interactive experience that requires little or no physical manipulation, such as moving a flip panel or looking into a drawer or mirror. Dynamic media might include studio art-making or involve large body movements. In the same way a visitor might be required to, or choose to, engage on a very active level or participation may be largely passive. When active visitor involvement meets a dynamic medium, then the effect is very 'hot', which means that there is much

physical activity and probably a higher noise level. Conversely, ‘cool’ experiences tend to be quiet and are generally seated or involve little movement. By using different media of communication and thinking of the visitor experience, museum professionals can create clusters of exhibits with varied levels of interactivity, ranging from very high (hot) to moderate (warm) to very low (cool). This can combat the ‘pinball’ effect and reduce the kind of frenzy that is often evident in children’s museums and science centres.

		MEDIA	
		Static	Dynamic
VISITOR	Active	WARM	HOT
	Passive	COOL	WARM

Table 2. A model for creating multi-sensory interactive spaces. (Adapted from the work of Roger Miles and Cynthia Moreno)

Often developers of interactive spaces operate with a tacit set of intentions that are not carefully articulated beyond a more global goal statement. It is the role of educators to clarify the expected outcomes for visitors, determine the content of the interactive space and consider how meaning can be constructed. It is also important for educators to understand how visitors engage and learn in interactive environments. In this way the outcomes can align realistically with the way people learn.

In addition, interactive experiences must be ‘responsible’ in order to communicate content and meaning effectively. The concept of responsible interactivity has two levels. First, just because children are touching or moving something does not mean that the experience is rich or meaningful. Beware of gratuitous interactivity! An interactive experience must align directly to the outcomes, which in turn are in direct relationship to the institutional interactive ‘mission’ statement. In addition, this relationship needs to be based on reliable data from visitor studies. We in the museum profession are not a good measure of what most people do on museum visits, or what they expect and take away from them. What might seem to make perfect sense on the drawing board does not always translate well when visitors attempt to engage with it. Second, responsible interactive experiences are appropriate to the mood and tenor of the situation. For example, if the art is playful in nature, then an interactive experience that stimulates visitor noise and movement is appropriate. Conversely, if the subject of the art is more serious, then interactive experiences need to encourage more subdued and reflective behaviour.

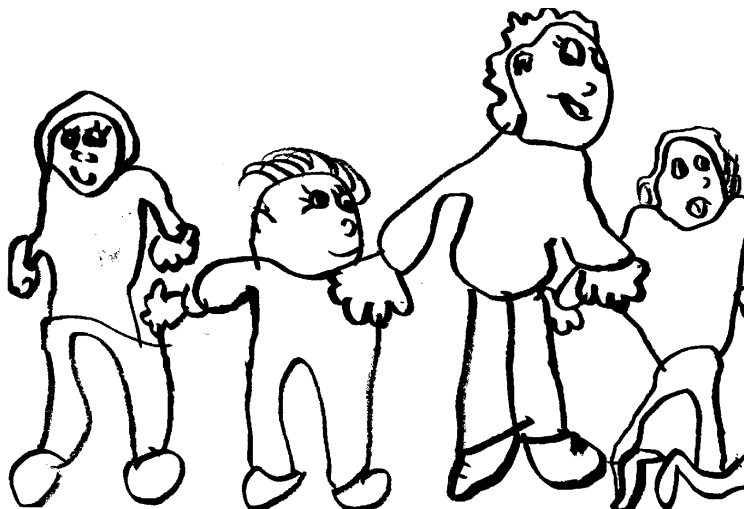
Cultural connections

We have found that successful interactive experiences contribute to visitors’ cultural appreciation and facilitate their understanding of how they fit within the culture,

community and family. Specifically, visitors like to place themselves in context, and this is particularly the case with families. Family groups choose to visit particular museums because these are perceived to play a specific role in the social life of the family group. Hence the motivation of family members to visit a museum can be seen to fit into wider socio-cultural patterns, but it can also fit into the family members' strategies for compiling their own lists or movements through the museum space.

For example, family groups at the Xperiment! Gallery at the Museum of Science and Industry in Manchester felt that the museum's buildings and collections were part of the history of Manchester and of their own personal history. Grandparents told their grandchildren stories from the time when one of the buildings was a goods warehouse. They also used the machines exhibited in the museum to tell stories about 'how life used to be' when they were younger. Further, parents used the museum to help their children learn about scientific principles and the process of science through hands-on exploration. Placing science and technology in their social context was one of the main reasons parents had for visiting that particular museum with their children, as science and scientists have historically played a central role in the city's industrial, social and political life. Visiting this museum brought them closer to the science and technology community and the cultural tools and methods of inquiry of this community. A large number of children also mentioned that they had visited the museum with their school before and came back to share the experience and their stories from the school visit with their family.

Parents told researchers that a quality interactive experience helped them feel that they were being good parents, providing children with important experiences that helped the family become what it wanted to become. In addition, the experience can help children in their appreciation of rich experiences shared with the family. On a larger scale, this cultural connection helps families link to the wider community and learn how to learn from cultural institutions.



This drawing by a six-year-old girl expressed her favourite part of a visit to the Speed Art Museum's Laramie L. Leatherman Art Sparks Gallery. She explained her drawing by saying that her favorite part of the visit was 'being with her family'.

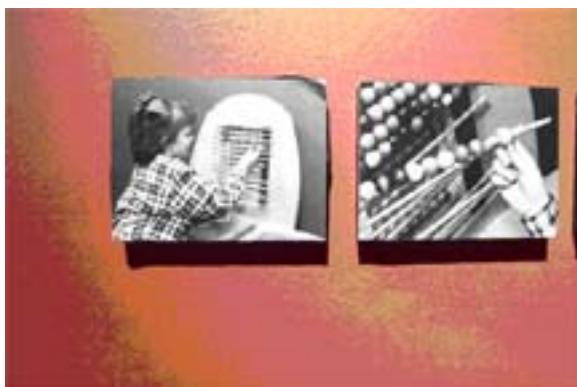
Empowerment

Visitors want a range of choice and control in their museum visit in general. Adults and children want to determine for themselves when, where and how they experience

the museum. However much exhibition curators and designers think or hope they can direct visitor attention and learning in specific ways, visitors ‘do it their way’. Even if the museum is successful in confining the visitors’ path through the exhibition, visitors choose what they will attend to and how deeply they will attend to it. Research suggests that children don’t like to be rushed in museums, and they don’t look forward to museum experiences they perceive to be rule-bound and over-supervised. This does not mean that children should be unsupervised; rather, it suggests that children respond well to environments that honour their interests and learning styles. It is important to design exhibits that invite visitors to bring their personal knowledge and prior experience to bear in order to facilitate visitors in the construction of their own experience at the museum.

The interactive component needs to be self-evident and accessible both physically and intellectually to a range of ages/abilities; and it needs to work! Unlike science and children’s museums, art museums have not had to deal with the problem of durability of their exhibits. Artists who designed an interactive exhibition around the theme of doors in Kidspace at MASS MoCA, for example, found they had to return frequently to repair their installation. And this exhibition did not receive particularly hard wear, for children were carefully monitored and facilitated during their time in the exhibition.

Accessibility issues often refer to the need to consider visitors with physical and mental impairments when designing museum experiences. This is certainly an important issue. Accessibility can also refer to the ease of access visitors have in understanding the concepts presented in an interactive experience, as well as in how to operate or engage with an interactive station. Parents, for example, have little time to read and digest operation instructions while supervising children. Operation of interactive experiences needs to be self-evident; that is, what to do becomes quickly apparent without the need for reading text. Again, a deeper understanding of visitors’ prior experience and expectations will assist museum educators in developing experiences that are organic to the way people learn through play. In addition, interactive experiences that are accessible to visitors of all ages will create a more family friendly environment.



An example of the visual directions at the Speed Art Museum’s Laramie L. Leatherman Art Sparks Interactive Gallery. The series of photos illustrate how the bead-weaving interactive station is to be used. This visual approach is beneficial for young children who do not know how to read, as well as helping parents to understand quickly how to assist their children with the activity.

Uniqueness

Visitors come to museums to see ‘cool stuff’ – they don’t come to do things they could (and maybe should) do elsewhere. For example, a strong theme that came out in two phases of a front-end visitor study at the San Diego Natural History Museum was that people came to the museum to see dinosaurs and specimens; they did not come to work on computer terminals. The visitors felt that information intended for an electronic format would be more useful to them on a website, so that they could use it for pre- and/or post-visit exploration. Museums in general, and specifically interactive experiences, need to focus on what makes the experience special or unique, to mine fully, as Howard Gardner expresses it, the ‘genius’ of the museum.

Visitors expect to see (and do) the extraordinary or to see the ordinary from an extraordinary perspective. A note of caution: this extraordinary/ordinary issue is more like a continuum or a tightrope. Visitors do not respond well if they perceive they have ‘been-there, done-that’. However, if an experience or a technology to access the experience is ‘too strange’, visitors also perceive this to be a problem. If there is no context or foothold for visitors to find entry into very foreign conceptual, intellectual, technological and/or aesthetic territory, they tend to ignore or reject it. This seems to be a particular problem for contemporary art. The interactive experience (and ideally the museum proper) needs to consider the context that people bring with them to the experience. For very familiar content or experiences there needs to be some different twist to the approach. For very strange or new experiences there has to be sufficient thought given to ways visitors can connect their own experience to the unfamiliar experience.

Construction of meaning: a personal journey and a socially mediated process

All of the above categories are used by visitors to create meaning (linking objects to personal experience). Just as visitors will construct their own experience, so they will also construct their own meaning, regardless of what museums do or what museums hope visitors do. It therefore seems wise not only to allow but also consciously to invite and facilitate a rich meaning-making process. The fact that visitors persist in making their own meaning does not imply that, like those who take relativism to its illogical extreme, all meaning-making is correct or equal. Rather, when museums begin to respond to research about visitor learning and meaning-making, they begin to develop grounded approaches that facilitate the meaning-making process so that visitors reach more plausible conclusions that are related to the object, its context and the ‘big’ ideas it raises. With contemporary artworks that require visitor participation to exist this is particularly important. Research strongly suggests that, to be successful, the interactive experience should be designed to alter the visitor’s conception of the art object. The object is contemplated, as always, but it is also modified in some way by the visitor as a result of the interactive experience.

In addition, the construction of meaning (or learning in the broadest sense) is also a culturally mediated process. Research suggests that successful interactive experiences embrace the visitor as part of his/her social group and that the interactive experience facilitates social learning. This is a relatively foreign concept to art museums. When demographic data on the configuration of social groups of visitors to US museums (family – with children or all-adult, friends, adult and alone) is compared across museums, art museums have a much higher percentage of lone visitors (between 30% and 55%). Some exhibitions in natural history museums have some variation in

percent of lone visitors (23%–26%) and, as might be expected, science centres have a much lower rate of lone visitors (0%–3%). Although there are some variations between different art museums across the UK, the breakdown of visitor groups to art museums in this country is very similar to that in the USA. These findings raise an important and troubling issue. Why do more visitors visit the art museum alone than is the case for other types of museums? Is alone the best way to see art? Or has the culture of the art museum communicated that social learning is not welcome? As noted before in this paper, research suggests that parents decide not to go to art museums with their children. As museums try to attract more family visitors and non-traditional audiences, these visitors will expect and need an environment that facilitates their experience as a social group. Research suggests that interactive experiences appear to address this issue in art museums.

Conclusion: from theory into practice

Several important themes emerge from this brief overview of visitor research related to interactive experiences. First, the research that has been conducted in art museums on any topic related to visitor learning is largely unpublished and consequently unavailable to the museum practitioner. In addition, even if museum practitioners could get access to the unpublished studies, it is a rather unreasonable to expect that they would have the time or inclination to plough through such studies and apply the lessons learned to their work. Clearly, this situation suggests that the art museum field needs to think about developing a shared research agenda and construct some means to share findings from research. This might be a place where the internet would be useful. The Museum Learning Collaborative (<http://mlc.lrdc.pitt.edu/>) has contributed greatly to this effort, but still more could be accomplished.

Second, the five categories presented in this paper have emerged from findings in many studies in both the USA and the UK. The framework represents a good place to start as museum practitioners think about their own forays into interactive experiences. The fact that something can be touched or manipulated does not make it a valuable or meaningful experience. One way the framework could be used is for museum practitioners to develop a matrix, similar to the one below, that will assist in planning new exhibits and troubleshooting existing interactive experiences for visitors. The idea is to list the interactive experience on the left column and, through in-depth conversations with the development team, assess each idea according to each category. For example, to what degree does an interactive station or installation engage visitors in meaningful multi-sensory dialogue? Are there sufficient opportunities for genuine exploration? How does the experience assist visitors in making the kind of cultural connections that research suggests is meaningful to them? To what degree does the experience empower visitors to create their own experience? And so on.

	MULTI-SENSORY DIALOGUE AND EXPLORATION	CULTURAL CONNECTIONS	EMPOWERMENT	UNIQUENESS	CONSTRUCTING MEANING
Interactive experience					

Table 3. Template for Interactive Exhibition Planning Matrix

It is possible that an interactive experience could be rated highly in some areas but not in others. This does not necessarily mean that the experience is not valid or should be withdrawn. Rather, it suggests that the museum practitioners need to determine how important the low-rated categories are and make conscious decisions about what to keep in the interactive experience.

And finally, we should remember that art museums are relatively new at providing interactive experiences for visitors. We cannot expect every effort to be 100% successful. As a field, we are experimenting and developing ideas. Certainly interactive science museums and children's museums have not figured out the secret. It is important, however, to try to be as conscious and thoughtful as possible as we design and assess our efforts at providing rich and meaningful interactive experiences to art museum visitors. To do this well requires more research, and the museum field needs to become more active in establishing a research agenda that will help it address the many concerns and issues that emerge as art museums venture more fully into the realm of interactivity.

Bibliography

- Adams, M. (1995): *Front-end Study for the Chicago School Artist Exhibition* at the Museum of Contemporary Art, Chicago. Unpublished report (Annapolis, MD: Institute for Learning Innovation)
- Adams, M. and Falk, J.H. (1996): *Formative and Summative Studies for MicroGallery at the National Gallery of Art*, Washington, DC. Unpublished report (Annapolis, MD: Institute for Learning Innovation)
- Adams, M. (1999): *Summative Evaluation Report for Art Learning Center Art Sparks Interactive Gallery* at the Speed Art Museum, Louisville, KY, unpublished report (Annapolis, MD: Institute for Learning Innovation)
- Adams, M. & Contini, H. (2001): *Front-End Evaluation Study for the San Diego Natural History Museum New Exhibition Design Process*, unpublished report, (Annapolis, MD: Institute for Learning Innovation)
- Adams, M., Cotter, N., and Cohen Jones, M. (2001): 'Year Two Evaluation Report of Kidspace: A Collaborative Project of the Williams College Museum of Art, the Massachusetts Museum of Contemporary Art, and the Sterling and Francine Clark Art Institute', unpublished evaluation report (Annapolis, MD: Institute for Learning Innovation)
- Adams, M., and Falk, J.H. (1996): 'Phase I & II Study of the Micro-Gallery at the National Gallery of Art, Washington, DC', unpublished report (Annapolis, MD: Institute for Learning Innovation)
- Adams, M., Falk, J.H., Cobley, J., and Pruitt, R. (1997): 'Phase I: Motivations and Expectations of the General Museum Visitor: Evaluation Report for the National Museum of African Art. Washington, DC', unpublished report (Annapolis, MD: Institute for Learning Innovation)
- Adams, M., and Haley Goldman, K. (2000): 'Summative Evaluation for I'm Growing Up! Exhibition for the Austin Children's Museum, Austin, TX', unpublished report (Annapolis, MD: Institute for Learning Innovation)
- Adams, M., Rogers, G., and Coulson, D. (2000): 'Year One Evaluation Report of KIDSPACE: A Collaborative Project of the Williams College Museum of Art, the Massachusetts Museum of Contemporary Art, and the Sterling and Francine Clark Art Institute', unpublished report (Annapolis, MD: Institute for Learning Innovation)
- Adams, M., Rogers, G., and Falk, J.H. (2000): 'Understanding Potential Visitors' Perceptions of Health: A Front-End Study for the Proposed National Health Museum, Washington, DC', unpublished report (Annapolis, MD: Institute for Learning Innovation)
- Anderson, D., and Piscitelli, B. (2001): 'Parental Recollections of Childhood Museum Visits', unpublished report for QUT Museums Collaborative, Centre for Applied Studies in Early Children (Queensland University of Technology, Australia)
- Eason, L., and Linn, M. (1976): 'Evaluation of the Effectiveness of Participatory Exhibits', *Curator*, vol. 19/1, 45–62
- Ellenbogen, K. (2002): 'Contrasting Cases: The Role of Museums in Family Life', paper presented at the Association of Science-Technology Centers Conference (Phoenix, AZ)
- Falk, J.H., and Dierking, L.D. (1992): *The Museum Experience* (Washington, DC: Whalesback)
- Falk, J.H., and Dierking, L.D. (2000): *Learning from Museums: Visitor Experiences and the Making of Meaning* (Walnut Creek, CA: Alta Mira)

- Falk, J.H., Moussouri, T., and Coulson, D. (June 1998): 'The Effect of Visitors' Agendas on Museum Learning', *Curator*, vol. 41/2, pp. 107–20
- Gammon, B., and Moussouri, T. (1995a): 'Formative Evaluation of the Garden', unpublished report (London: Science Museums)
- Gammon, B., and Moussouri, T. (1995b): 'Formative Evaluation of Things exhibition', unpublished report (London: Science Museums)
- Graham, B. (1996): 'Not a Show about New Technology: A Show about Interaction', in Graham, B. (ed.), *Serious Games: Art, Interaction, Technology*, exhibition catalogue (London: Barbican Art Gallery and Tyne and Wear Museums), pp. 6–9
- Gregory, R. (1989): 'Turning Minds on to Science by Hands-On Exploration: The Nature and Potential of the Hands-On Medium', in Quin, M. (ed.), *Sharing Science: Issues in the Development of Interactive Science and Technology Centres* (London: Nuffield Foundation/COPUS), pp. 1–9
- Griffin, J., and Symington, D. (1998): 'Finding Evidence of Learning in Museum Settings, Paper presented at Questacon conference: *Learning Science in Informal Contexts*, 5–7 August 1998 (Canberra, Australia)
- Hein, H. (1990): *The Exploratorium: The Museum as Laboratory* (Washington, DC: Smithsonian Institution)
- Hooper-Greenhill, E., Moussouri, T., Hawthorne, E., and Riley, R. (2001): *Making Meaning in Art Museums 1: Visitors' Interpretive Strategies at Wolverhampton Art Gallery* (RCMG, University of Leicester)
- Jensen, N. (1995): 'Children's Perceptions of the Their Museum Experiences: A Contextual Perspective', *Current Trends in Audience Research and Evaluation*, vol. 9 (Philadelphia: AAM Committee on Audience Research and Evaluation)
- Leinhardt, G., and Crowley, K. (2002): 'Objects of Learning, Objects of Talk: Changing Minds in Museums', in Paris, S. (ed.), *Multiple Perspectives on Children's Object-Centered Learning* (Mahwah, NJ: Lawrence Erlbaum Associates)
- Lewis, P. (1993): 'Touch and Go', *Museums Journal*, February 1993, pp. 33–4
- Luke, J., M., Adams, M., and Cohen Jones, M. (2001): 'Mummies, Manuscripts and Myths, Year 1 Evaluation. Walters Art Museum, SuperKids Camp at the Parks and People Foundation, and Reading is Fundamental', unpublished report (Annapolis, MD: Institute for Learning Innovation)
- Luke, J.J., Coles, U., and Falk, J.H. (1998): 'DNA Zone Summative Evaluation for the St Louis Science Center', unpublished report (Annapolis, MD: Institute for Learning Innovation)
- Luke, J.J., Wadman, M.E., Haley Goldman, K., and Dierking, L.D. (2001): 'Summative Evaluation Phase I Report for the Magic: The Science of Illusion Exhibition at the California Science Center', unpublished report (Annapolis, MD: Institute for Learning Innovation)
- Miles, I., and Thomas, T. (1993): 'User Resistance to New Interactive Media: Participants, Processes and Paradigms', in Bauer, M. (ed.), *Resistance to New Technology: Nuclear Power, Information Technology and Biotechnology*, conference proceedings, Science Museum, London (Cambridge: Cambridge University Press), pp. 255–75
- Miles, R. (1996): 'Thinking about Visitors', workshop presentation at the Natural History Museum, London

- Moussouri, T. (1997a): 'Family Agendas and Family Learning in Hands-On Museums', unpublished doctoral thesis, University of Leicester
- Moussouri, T. (1997b): 'Summative Evaluation of the Network', unpublished report, Science Museums, London
- Moussouri, T. (1998): 'Front-end Evaluation of the Robot Zoo', unpublished report, Science Museums, London
- Moussouri, T. (1999): 'Formative Evaluation of the "Footprints"', unpublished report, Science Museum, London
- Piscitelli, B., and Anderson, D. (2001): 'Young Children's Perspectives of Museum Settings and Experiences', *Museum Management and Curatorship*
- Ramsay, G. (1998): 'Investigating "Interactives" at the Powerhouse Museum: Personal, Social and Physical Context', Proceedings from EdTech '98, Australia;
<http://cleo.murdoch.edu.au/aset/confs/edtech98/pubs/articles/rs/ramsay.html>
- Williams, M. (1990): 'Understanding is Both Possible and Amusing', *Physics Education*, vol. 25, pp. 253–7

Marianna Adams

Marianna Adams is Senior Associate at the Institute for Learning Innovation, a non-profit educational research organisation based in Annapolis, MD. She has headed education departments at the Ringling Museum of Art, Sarasota, FL, and Museum of Art, Ft. Lauderdale, FL. She served as co-coordinator for the summer 1995 Teacher Institute at the National Gallery of Art, Washington, D.C. She has taught public and independent school K-12, upper school literature and composition, middle and upper school art, middle school social studies, and has worked with elementary-level emotionally disturbed children. As head of the visual arts subcommittee, she served on the National Arts Education Assessment Consensus Project from 1992-1994. Additional tasks related to that project included working with the Educational Testing Service in the development of arts assessment tasks and scoring rubrics. She has been active in the Museum Education Division of the National Art Education Association (NAEA), serving as the Southeast Regional Director and being awarded the Southeast Museum Educator of the Year for 1994 and the National Museum Educator of the Year for 2001. Her master's degree in arts education was earned at the University of South Florida and her doctorate in education policy studies is from the George Washington University. Adams has wide experience in conducting evaluation studies in all types of museums and cultural organisations across the country. Her particular research interests are in evaluation as an agent of organisational change, professional development and participatory evaluation, new methodologies for collecting data from children, and the impact of multiple visit museum programs on student learning. She was recently awarded an NAEA research grant to conduct a meta-study of compiled research on multiple visit school/museum programs.

Theano Moussouri

Theano Moussouri is a Research Associate at the Research Centre for Museums and Galleries (RCMG), Department of Museum Studies, University of Leicester. She is currently involved in a research project funded by Resource investigating ways of defining the outcomes of learning in museums, libraries and archives as well as developing a toolkit for assessing these outcomes. She is also involved in developing an exhibition on Ancient Greek mathematics for the Foundation of the Hellenic World, Athens, Greece, and the education website for the exhibition on the Greek revolution

for the Greek Parliament. Her current research interests include developing qualitative research methodologies and using the concept of interpretive communities and communities of practise to research the construction of meaning and knowledge in museums and the social role of museums. In the past, she worked on a number of different evaluation projects for the Science Museum, London, the exhibitions department of the Greek Parliament, the Foundation of the Hellenic World and the Hellenic Network for Corporate Social Responsibility. She has also developed a museum studies course for the adult learning programme of the Greek-American College, Athens, Greece, and has taught courses on museum education, communication, research and evaluation at the University of Thessaly, Volos, Greece. Theano Moussouri holds a first degree in Education from the University of Athens, Greece, M.A. and Ph.D. in Museum Studies from the University of Leicester, Leicester, UK, and has carried out research at a post-doctoral level at the Smithsonian National Museum of Natural History for the Institute of Learning Innovation, Annapolis, MD, USA.