

**Rediscovering Discovery Rooms:  
Creating and Improving Family-friendly  
Interactive Exhibition Spaces in Traditional Museums**

by

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July 18, 2006

Submitted in Partial Fulfillment

Of the Requirements for the Degree of

**Master of Arts**

in

Museum Studies

in the

School of Education and Liberal Arts

at

John F. Kennedy University

Approved:

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Department Chair

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Date

"Tell me and I forget. Teach me and I remember. Involve me and I learn."

– Benjamin Franklin

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## Executive Summary

Think about the last museum exhibition you saw. Try to remember how you felt, what objects were on display, and the content of the labels and interpretive panels. Now, what three *new* facts did you learn? Donald Sibbett, Principal and Museum Exhibit Designer for The Sibbett Group, begins his first meetings with clients in this fashion. Although his clients are themselves museum professionals, it is rare for one of them to be able to answer the question. He continued: “If they can name three, I give them an A plus.”<sup>1</sup> While it may be a simple question, Sibbett’s exercise exposes the fact that visitors’ museum experience goes far beyond learning facts. Moreover, it demonstrates that traditional, didactic exhibitions – where visitors are looking at objects and reading wall text – are *not* enough to create a memorable learning experience.

Museums have found one solution to this problem – the discovery room. Since the opening of the first discovery room at the Smithsonian Institution’s National Museum of Natural History in 1974, several museums have followed suit and created their own interactive exhibition spaces. Discovery rooms are spaces, set aside from traditional museum galleries, which feature activities, objects, artifacts and exhibits to provide visitors with interactive, discovery experiences. When well-designed and operated, interactive exhibition spaces provide visitors with rich learning experiences in which they can form deep connections and understandings about the museum’s collection. Moreover, these

spaces are ideal for intergenerational education where small groups of family visitors can talk and learn with one another. Museum educators and exhibit designers can design a discovery room that reflects the theories and ideas of the great developmental psychologists and educational philosophers of our time.

For this project, I wanted to uncover the current state of discovery rooms, exhibit design practices and characteristics of successful spaces. The resulting report features four main research methods: a literature review, survey, interviews and site visits. The main goals of my research were to understand how museums could appeal to families, engage visitors of all ages and design a space that is an optimal learning environment. I reviewed articles, case studies, visitor studies, books and other publications regarding learning theories (post-1990) and family learning in museums and discovery rooms. Next, I mailed a one-page survey to museum educators who work in traditional museums in California. This survey revealed insights into the educator's understanding of the creation and operation of a discovery room. I then interviewed outside exhibit designers from private firms across the country to get their perspective on the design process as well as on their working relationship with museums. Additionally, I interviewed independent museum consultants, in-house exhibit designers and museum educators to understand their views on how interactive exhibit spaces can promote intergenerational learning. Lastly, I visited California museums with discovery rooms to see how visitors interacted within the space. I also conducted

preliminary site visits to several museums in the Boston and Washington, D.C. areas.

I present my research in two sections – a literature review and findings. My literature review revealed that true learning is born out of personal, discovery-based experiences. When discovery-based activities are performed in small groups and encourage social interaction and conversation, they foster family learning. Discovery rooms are the ideal space in traditional museums to offer these kinds of social learning experiences. My findings revealed that museums may be missing an opportunity to better serve their audience. One of the main challenges I uncovered was a disconnect, or a communication breakdown, between museum educators and exhibit designers. Another conclusion, perhaps more alarming, is that museums lacked a concrete and specific vision for their discovery rooms with project goals and learning outcomes.

After analyzing my findings, I developed recommendations as well as a manual for museum educators and in-house designers who are creating or updating a discovery room. It is crucial for museums to reevaluate their discovery room to meet the needs and learning abilities of their family visitors. Because over sixty percent of visitors come in small intergenerational groups, it behooves museum educators to ensure that not only the discovery room, but also that the museum itself addresses this audience. I argue that all visitors to the discovery

room and museum itself will benefit when museums design for the family audience and provide discovery-based experiences.

## Glossary of Terms Used in this Project

The following definitions were obtained from articles and other literature on learning theory and educational philosophy.

**Activity boxes:** A box of related objects to be interpreted through accompanying materials, such as booklets, games, cards or questions. Each box is a small, interactive activity with labels, instructions and supporting materials. Boxes can be used on site or checked out for a period of time.

**Artifakes:** Objects meant to replicate priceless and fragile objects in the collection, generally to be touched by the visitors.

**Collaborative learning:** Learning that takes place in groups when learners perform the same task simultaneously and problem solve together. The discovery or exploratory process is shared among members of the group. Such learning includes the sharing of tasks, skills, abilities and authority.

**Concept-based learning:** Learning through an understanding of main concepts.

**Constructivism:** The idea that individuals construct or make their own meanings and understanding of the world through prior knowledge and reflection on experiences and beliefs. Constructivism takes into account the visitor's prior knowledge and intelligence and ensures that the visitor is engaged and that learning is active and accessible.

**Didactic learning:** Learning facts and figures through reading or lectures. Didactic learning is associated with classroom style learning in which the goal is to remember specific facts and information.

**Discovery:** The uncovering of information or finding of connections and forming opinions based on exploration.

**Discovery-based learning:** Learning through discovery of information by individual learners or small groups. In discovery-based learning, tasks are generally performed unassisted or with little help or guidance; answers are never given. Muska Mosston specifies ten cognitive operations that might take place as

the learner engages in active inquiry: recognizing, analyzing, synthesizing, comparing and contrasting, drawing conclusions, hypothesizing, memorizing, inquiring, inventing, and discovering.

**Discovery cart:** A cart with objects on it for hands-on learning. Usually staffed with an educator to facilitate games, activities or ask questions.

**Discovery room:** A separate area, within the context of a traditional museum, that features activities, objects, artifacts and exhibits to provide visitors with hands-on discovery experiences. Also known as: family gallery, discovery space, discovery gallery, family gallery, exploration room, children's room, children's gallery, etc.

**Evaluation:** Assessment of the effectiveness of a program or exhibit in achieving its objectives. Judging the process and outcomes on established criteria; evaluation relies on the standards of project design and aims at program improvement through a modification of current operations. Can include formal and informal evaluation: evaluation forms, personal interviews, prototyping sessions, comment cards, etc.

**Experiential learning:** Learning through new personal experiences and reflecting upon how these experiences fit the framework of past experience. Experiential learning refers to an individual's growth and change through time.

**Exploratory learning:** Learning through exploration and experimentation with objects, senses and activities to uncover relationships and unexpected lessons. It is associated with developing generalized thinking and problem-solving skills.

**Family:** An intergenerational group of two or more casual visitors consisting of at least one adult aged 18+ and one child, including but not limited to parents, grandparents, caregivers, teens, children, infants and multiple siblings or friends. For the purposes of this project, individuals within these small groups do not have to be genetically related but are intimately related and not part of a school or tour group.

**Family-friendly:** Having the qualities necessary to appeal to, engage and cater to the needs of families.

**Family learning:** Learning that is mediated through social interaction within the family when all family members are engaged and actively participate.

**Flow:** A spontaneous feeling of complete focus and immersion in an activity, with a high level of enjoyment and fulfillment. Often refers to intrinsically motivated activities.

**Free choice learning:** Learning experiences that are voluntary, self-directed and guided by the learner's needs and interests.

**Hands-on:** Physical interaction with the exhibits, which involves active participation and the ability to touch and manipulate objects. The goal is to provoke critical thinking skills, acquire understanding, and construct meaning.

**Hands-on learning:** Learning through kinetic activities that directly involve and engage the learner with the material.

**Inquiry-based learning:** Learning through the active seeking of answers to the learner's own questions. For the student, the learning is personally relevant as well as both intrinsically motivated and self-directed by curiosity.

**Interactive:** Implies mental engagement but not necessarily physical interaction. In other words, interactive elicits a response or reaction from the visitor; promotes an exchange of information or opinions and allows physical exploration of objects that involves choice and initiative. For the purposes of this project, interactive does not mean computer technology or programs.

**Interactives:** Exhibit components that are interactive (see above).

**Intrinsic motivation:** Doing an action for its own sake. Motivation is self-created and based on the enjoyment of the behavior itself rather than external or extrinsic rewards.

**Manipulatives:** Physical materials such as blocks, tiles or other objects that are manually manipulated to construct forms and solve problems.

**Minds-on:** Promotes active thinking and questioning, generally used when touching is not allowed.

**Multiple intelligences:** Howard Gardner's theory that there are eight intelligences: verbal-linguistic, musical-rhythmic, visual-spatial, logical-mathematical, bodily-kinesthetic, naturalist, interpersonal, and intrapersonal.<sup>2</sup> An individual has her own combination of intelligences that work together dependently. Because of this, people do not all learn in the same way.

**Prototyping:** Systematic testing of the design, features and functionality of an exhibit to find errors, solve problems, and gather visitor comments and feedback. Prototyping evaluates the overall idea and concept.

**Scaffolding:** The act of adults or skilled experts as helpers in guiding a child to grow intellectually. Related to the zone of proximal development.

**Stumpers:** Unusual objects that visitors will not know and will think are strange. Stumpers are used to evoke curiosity and questioning.

**Zone of proximal development (Zoped, ZPD):** Lev Vygotsky's term for the time between which a child can solve a certain problem only with help from another and the time when the child can solve the same problem independently. Vygotsky believed this was the crucial time for full social engagement of the child in order to achieve maximum learning.

## **Statement of Purpose**

For my master's project, I researched family learning in discovery rooms. For the purpose of this study, I define "discovery room" as a separate area, within the context of a traditional museum, that features activities, objects, artifacts and exhibits to provide visitors with interactive, discovery experiences. I use the terms *discovery room* and *interactive exhibition space* interchangeably. My definition of a family is an intergenerational group of two or more casual visitors consisting of at least one adult aged 18 and older and one child. To study this issue, I reviewed current literature; interviewed exhibit developers and museum consultants within the United States; surveyed museum educators who work in anthropology, art, history, natural history, or specialized museums in California; and performed site visits to institutions with a discovery room in Southern California.

The purpose of this project is to inform museum educators how to design their own family-friendly interactive exhibition space. This project can also help museum educators improve the current state of their discovery room to engage family visitors. My end product is a small booklet that outlines eleven concrete steps to creating discovery rooms. Designed for museum educators and in-house exhibit designers, the booklet discusses the characteristics and issues involved with discovery rooms that actively engage families and provide an optimal learning environment.

## **Goals & Objectives**

Goal 1: To research the theories, principles and resources used to create a discovery room.

Objective 1: To review the literature on discovery rooms and compile survey results from museum educators at a California museum.

Goal 2: To understand the dynamics of family learning as well as the motivations, needs and expectations of family visitors to museums.

Objective 1: To analyze visitor studies and other literature from the field as it pertains to demographics of family visitors and intergenerational learning theory.

Goal 3: To identify characteristics of successful exhibits and programs that attract and enhance family learning.

Objective 1: To review exhibit evaluations, visitor studies and other literature from the field as it pertains to successful exhibit development for family learning.

Goal 4: To uncover the current state of discovery rooms, including the basic characteristics that define them.

Objective 1: To survey and assess survey data on museums in California with interactive spaces.

Objective 2: To analyze data from interviews with exhibit developers across the United States.

Goal 5: To develop criteria for creating a discovery room that reflects best practices in family learning and exhibit development.

Objective 1: To interview and survey exhibit developers and discovery room experts in the field on guiding examples and resources for interactive spaces.

## Methodology

In order to uncover how museums can engage intergenerational learners through family-friendly exhibits within a discovery room setting, I conducted a literature review; interviewed exhibit developers, exhibit designers, museum educators and consultants; and surveyed museum educators.

For my literature review, I examined texts that discuss learning theory, family learning within museums and discovery rooms. Texts included journal articles, books, visitor studies, exhibit evaluations, and notes or articles from symposiums and professional development conferences. My research covered seminal educational philosophers, developmental psychologists and educators such as John Dewey, Lev Vygotsky and George Hein. As there is a plethora of information about family learning, I focused that segment of my literature review on family visitor studies conducted after 1990 because opinions on education and learning within museums have evolved through the years. The most notable literature on families in museums is a study performed by the Philadelphia Informal Science Education Consortium (PISEC) in 1998. This PISEC study was invaluable as it provided the backbone structure for understanding how families interact and learn in museums. As for discovery rooms, I present a brief history on the first discovery rooms created at the Smithsonian Institution as well as current case studies on interactive exhibition spaces in various museums. Essential texts included information about the first discovery room in *Snakes, Snails, and History*

*Tales: Approaches to Discovery Rooms at the Smithsonian Institution* as well as a paper synthesizing issues discussed at the J. Paul Getty Museum Symposium in Los Angeles entitled, *From Content to Play: Family-Oriented Interactive Spaces in Art and History Museums*.

I contacted twenty exhibit developers and designers, eleven of whom I was able to interview about their experiences creating and designing interactives and interactive spaces for families. Interviews were conducted on the phone when face-to-face interviews were not possible. I obtained names of exhibit designers and firms from the literature on family-oriented exhibit spaces, the National Association for Museum Exhibition (NAME) member list, the California Association of Museums (CAM) 2006 Conference attendee list and through referrals from other interviewees. I targeted exhibit design firms that have experience creating discovery rooms and visitor centers, as well as designing for children's museums, science centers and family-friendly museum spaces. The selected exhibit designers and developers work for the following firms across the United States: Amaze Design; architectureisfun, Inc.; ESI Design; Jeff Kennedy Associates; Lehrman Cameron Studios; One + Two, Inc.; Pacific Studio; The Sibbett Group; WEATHERHEAD Experience Design Group, Inc.; Wondercabinet Interpretive Design, Inc. and a private contractor.

To structure the interviews, I created a set of questions to direct our discussion. Prior to our interview, I emailed the interviewee a list of questions.

After a few interviews, I revised the questions in order to draw out more specific information (see Appendix A for interview questions). A small fraction of interviews did not follow this format, yet all interviews covered the main topics of project logistics and vision for the creation of a discovery room. Questions were designed to uncover the designers' challenges, top priorities, inspiration, evaluation and definition of success. The goal of these interviews was to understand the challenges and successes firms encounter when working with museums to create discovery rooms. My questions focused on discovering what firms felt their clients could do to create a better working relationship.

To gain deeper insight into the museum professional perspective, I interviewed several educators and consultants who have worked with discovery rooms, family learning in museums and children's museums. I contacted Caryl Marsh and Judith White (Marcellini), the two women involved in the creation of the first discovery room at the National Museum of Natural History (NMNH) in Washington, D.C..<sup>3</sup> I also spoke with former Smithsonian educator, Mary Alexander<sup>4</sup>, and Janet Kamien, an independent museum consultant specializing in planning and exhibition and who is also a member of The Museum Group. I interviewed Susy Watts, a consultant for family-friendly spaces, including *ArtQuest* at the Frist Center for the Visual Arts, Nashville, TN. In addition, I discussed the U.S.S. Constitution Museum's IMLS National Leadership Research Project with Family Learning Project Coordinator Marilyn Solvay. During this

three-yearlong project, which began in 2002, over 500 families have been observed and interviewed in a prototype interactive exhibition, *A Sailor's Life for Me?* at the U.S.S. Constitution. Jenny Sayre Ramberg, Monterey Bay Aquarium's Senior Exhibit Developer and Writer, discussed the exhibition process of the interactive, family-oriented *Splash Zone* at the aquarium. Vas Prabhu, Deputy Director of Interpretation and Public Programs at the Peabody Essex Museum (PEM) in Salem, MA, shared insights into PEM's interactive exhibition space, *Idea Studios*. Also discussing the creation of her discovery room, Curator of Education Kathleen Hamilton spoke about the *Children's Discovery Room* at the Museum of Man in San Diego, CA.

I mailed a one-page, double-sided survey to museum educators who work in California Association of Museum (CAM) member institutions (see Appendix B for survey and Appendix C for survey results). I limited my survey to California museums to eliminate potential differences created by education departments appealing to state curriculum standards. I received thirty-eight completed surveys. I aimed to survey all CAM museums except for children's and science museums, which regularly use interactives and hands-on exhibits and are thus excluded from this study. I also mailed surveys to museum educators who worked in large museums in San Francisco and San Diego yet were not current CAM members. From the list of nearly five hundred CAM members in 2005-06, I sent a survey to museums within California and excluded institutions that were

not museums, located in California or did not have a website. I decided that not having a website constituted a museum that was small and/or lacked resources and thusly was outside the scope of my project. My goals for the survey were to understand the museum educator's main audience, design inspiration, educational goals and resources for their interactive spaces, if indeed they had interactive spaces.

In addition to the literature review, interviews and surveys, I conducted site visits to discovery rooms. I observed first-hand the programs and design of the following sites: the *Family Discovery Gallery* at the Autry Museum of the American West, the *Getty Family Room* at the J. Paul Getty Center, and the *Discovery Room* at the Natural History Museum of Los Angeles County. All three of these museums are large institutions located in Los Angeles, CA. Prior to my thesis, I performed preliminary site visits to the following interactive exhibition spaces: *Idea Studios* at the Peabody Essex Museum in Salem, MA; the Museum of Science's *Discovery Center* in Boston, MA; the *Boone Children's Gallery* at the Los Angeles County Museum of Art; the National Museum of Natural History's *Discovery Room* in Washington, D.C. and *Daniel's Story* at the United States Holocaust Memorial Museum in Washington, D.C.

### **Limitations of Methodology**

This project on discovery rooms was limited in scope, size, geography and museum type, due to time, logistics and economic considerations. Subjects that do not include learning theory, family learning in museums or discovery rooms and other interactive exhibit spaces are beyond the scope of my research and thus were not covered in this study. This includes issues like financial considerations, institutional politics and marketing data about families. I also did not perform a visitor research study on any of the discovery rooms mentioned.

I elected to focus on traditional museums with an anthropology, art, history, natural history, or specialized collection. Because of my definition of discovery rooms as being interactive spaces within a traditional, didactic museum, I excluded children's museums and science centers. I also did not specifically research aquaria, zoos, nature centers and botanical gardens, all of which may have interactive spaces that could be useful for this project.

My project is limited to museums, educators, exhibit developers and literature about discovery rooms within the United States. Due to my specialization of education and interpretation, I focused narrowly on educational learning theory and how discovery rooms can utilize these principles to enhance family learning in museums through discovery rooms and other interactive exhibition spaces. Time, geography, and economic restraints did not allow me to visit every discovery room discussed, including museums that are currently in the

process of creating a family-friendly interactive space. The case studies researched in my literature review focused on family learning and discovery rooms within U.S. museums except in three instances, a visitor study from the Queensland Museum in Australia; the book, *Knowledge Quest: Australian Families Visit Museums*; and a case study on the discovery gallery at the Royal Ontario Museum in Canada.

Although museums in other states and other countries may have a discovery room, I chose to survey education departments in California museums. Due to time and resources, I was unable to survey all members of the California Association of Museums (CAM) not to mention all museums in California. Museums that were not CAM members in 2005-06 were excluded from this study as well as CAM museums that did not contain a website. Museums that did not fall within the geographical or collection specifications were not surveyed.

My interviews were constrained by the sample size of the group as well as the apparent lack of diversity. Exhibit developers from design firms generally work with large and/or well-established institutions that have the funds necessary to hire an outside firm. I excluded design firms whose website and literature did not explicitly mention discovery rooms, interactive design or designing for children and families. I was unable to conduct all interviews in person and therefore had to rely on telephone conversations. Due to the use of ambiguous terminology and divergent definitions, interpretation of our conversation relied

heavily on context. Data collected was limited to the opinion and discussions of the interviewees.

Areas that are beyond the scope of my project include exhibits that are not interactive or kinesthetic. Interactive spaces that did not fall into my definition of discovery rooms – a separate area, within the context of a traditional museum, that features activities, objects, artifacts and exhibits to provide visitors with hands-on, discovery experiences – were not studied. Also beyond the scope of my project are visitors that are not part of a family or intergenerational group. I did not explore learning theories or visitor needs of school groups, children, teens, adults and seniors.

Additionally, while some museums may choose to use computer-based games or other compute programs in their discovery rooms, I chose not to delve into this complex discussion about the use of computer technology in discovery rooms. There is reason to believe, according to developmental psychologists, that computers are not beneficial for young children and may actually hinder learning qualities such as attention span. The use of computers by young children is a controversial topic in the education field and therefore lies outside the scope of my project.<sup>5</sup> Personally, I do not advocate for computer games or technology in discovery rooms because I believe that a discovery room should offer first-hand experiences with the object. Also, I do not feel that visitors should be presented with computer-mediated experiences when the museum's collections can be used.

Plus technology in discovery rooms involves decisions about money, staffing, training and expertise, a discussion that is well beyond the scope of this project.

## **Literature Review**

To understand how museums use discovery rooms and other interactive exhibition spaces to enhance family learning and engagement, literature on how people learn, family learning in museums and characteristics of discovery spaces should be closely examined. In this section of my master's project, I provide an overview of learning theories and philosophies from major figures in education and developmental psychology, ideas that have influenced the museum field. Literature on learning theory creates a foundation for understanding how families learn and ultimately how museums can create family-friendly learning environments.

### **Learning Theory**

One of the most influential learning theorists of the 20<sup>th</sup> Century was progressive educator and philosopher John Dewey. Although Dewey's work dates to the earlier part of the twentieth century, his work saw a resurgence of interest in the United States during the social movements of the 1960's. His progressive educational ideas emphasized the importance of individual freedom and control. As a direct response to Dewey's criticism of traditional didactic learning, schools were built with student-centered, open classrooms. The focus was placed on the learner and not on the educator or institute of learning. In his 1938 seminal work, *Education and Experience*, he criticized both traditional and progressive

schooling. In traditional education, children are passive learners. Schools teach, utilize rote learning and do not provide connections to the wider world. As a direct contrast, progressive schooling is student-directed and incorporates the learner's past experiences. Guidance from adults is considered an invasion of the students' freedom. However, without this guidance, there is no control of the quality or value of experience. This can lead to mis-educative effects, that "[arrest or distort] the growth of further experience."<sup>6</sup>

Looking ahead to a new movement in education, Dewey proposed that *educative* experiences result when *continuity* and *interaction* intersect. *Continuity* is the notion that accumulated learned experience influences the nature of one's future experiences; "what [a learner] has learned in the way of knowledge and skill in one situation becomes an instrument of understanding and dealing effectively with the situations which follow."<sup>7</sup> *Interaction* refers to how past experiences interact with a present situation. In other words, one's present experience is derived from the interaction between one's past experiences and a current situation. Dewey emphasizes that education must be based upon actual life-experience of the learner. Growth depends upon presenting challenges based on experience that can be solved through intelligence and result in a quest for information and stimulation of new ideas.

Dr. George Hein, professor emeritus at Lesley College and Senior Research Associate with the Program Evaluation and Research Group (PERG),

interprets Dewey's educational concepts as having direct implications for museum exhibits. Dewey considered museums "an integral part of the rich life experiences that contribute to education."<sup>8</sup> To Dewey, museums are sites that help schools connect with life outside. He believes that all learning environments should reevaluate this connection. Hein further asserts that museums, by extension, need to form connections between their educational offerings and life activities.

Hein argues that museum exhibitions should lead to inquiry, the result of which should apply to life situations. Museum experiences are not educational unless they "foster discussion, challenge the learner, make connections to issues of interest to the learner, and provide guidance for application in the world outside the museum." Hein believes that Dewey's theories imply that exhibit developers would do well to concentrate on the visitor experience as opposed to the learning outcome. In this sense, Dewey lays the foundation for the importance of interactive exhibit design. Furthermore, his firm belief in education as experience, as well as the importance of prior knowledge for the basis of meaning making, form the roots for Hein's theory of a constructivist museum.<sup>9</sup>

Commenting on *Education and Experience*, exhibition developer Ted Ansbacher also applies Dewey's major ideas to museum issues. Visitors' actions within their social and physical environment affect how they feel and learn, Ansbacher tells us. Because of this, exhibit designers should create an

environment that enables educational experiences rather than one that is simply aesthetically pleasing or architecturally sound. They should be more aware of cognitive, affective and performance outcomes. Ansbacher argued, “If...one accepts Dewey’s position that visitors develop learning from their own experiences, then the exhibition goals shift from the outcomes to the experiences themselves.”<sup>10</sup>

Just as Dewey discussed two opposing views of education – traditional versus progressive. Museums have also wrestled with this dichotomy. Reacting against closed-ended exhibits and didactic labels, some museums have opted to change the style and content of exhibits and labels, making them more open-ended and accessible to visitors with many learning styles. Ansbacher asserts that the museum experience needs to be assessed in order to produce desirable effects on subsequent experiences in museums. Three areas of interest are “setting goals for exhibits; evaluating exhibits; and sorting out the relationship between entertainment and education.”<sup>11</sup> When designing for the visitor experience, museums must balance education and entertainment. If an exhibit is immediately enjoyable but does not engage the visitor nor promote future experiences, it may be mis-educative. On the other hand, if an exhibition delivers information passively as opposed to offering opportunities for active inquiry, the visitor’s thinking is not engaged and understanding is not achieved. Dewey views education as a continuous spiral of three inter-related experiences. First, the

learner is presented with a problem that grows out of past experience; this problem is challenging yet within the learner's abilities. Next, the process provokes an active quest for information; and finally, the learner produces new ideas. This description is often referred to as Inquiry Learning. If museums wish to adapt Inquiry Learning methods, then exhibitions must allow visitors to move through this spiral path.

According to the principle of continuity, each visitor's experience is defined as unique. Ansbacher believes that exhibit developers must appeal to this wide range of museum audiences, knowing that no two visitors will experience an exhibit in the same way. To apply continuity to exhibits, Ansbacher proposes two solutions: 1) conducting front-end evaluation – such as interviews or focus groups, and 2) placing staff on the floor to interact with visitors in order to make immediate exhibition alterations.

Just as each visitor's experiences is unique, so are his or her capabilities. Harvard University professor and neuropsychologist Howard Gardner proposes a theory of Multiple Intelligences (MI) that relates directly to Dewey's notion of continuity. While not a learning theory *per se*, Gardner's theory of Multiple Intelligences has implications for education and museums. Studying psychologist Jean Piaget's research on children's cognitive development, Gardner speculated that children think like artists. Gardner's research illuminated the notion that people possess a range of capacities that cannot be captured or recognized on an

IQ test. Moreover, strengths in one area do not predict strengths in another. He defines these capacities as intelligences, the “biopsychological potential to process information that can be activated in a cultural setting to solve problems or create products that are of value in a culture.”<sup>12</sup> In other words, intelligence is the action of problem solving using different abilities that sharpen depending upon one’s prior experience, cultural setting and motivational factors.

At first, Gardner identified seven intelligences: *linguistic*, *logical-mathematical*, *musical*, *bodily-kinesthetic*, *spatial*, *interpersonal* and *intrapersonal*. *Linguistic* intelligence uses language to accomplish goals, while *logical-mathematical* intelligence analyzes problems logically and scientifically. To solve problems, *musical* intelligence entails musical patterns; *bodily-kinesthetic* intelligence involves using the body; and *spatial* intelligence features manipulation of space. *Interpersonal* intelligence requires understanding of the intentions, motivations and desires of others, thereby enabling one to effectively work with people. Understanding oneself is essential for *intrapersonal* intelligence.<sup>13</sup> Gardner claims that although the intelligences are relatively independent of each other, people often combine them to adapt to life conditions and cultural expectations.<sup>14</sup> Therefore, each person possesses a unique blend of intelligences, which can be strengthened. In 1999’s *Intelligence Reframed*, Gardner proposed an additional three possible intelligences: naturalist, spiritual and existential.

Gardner does not judge the types of intelligence. Yet, he feels, schools typically value linguistic and logical-mathematic intelligence and neglect the other capacities. When applying his theory of MI to museums however, Gardner quotes Exploratorium founder Frank Oppenheimer's classic observation that "nobody flunks museum." Unlike schools, children's museums naturally reflect MI theory; visitors are self-paced and can follow their own personal agenda. When a children's museum adopts educational goals, Gardner states, activities can be designed to arouse interest and engage a range of intelligences. Art museums, Gardner explained, do not allow for touching and are thus less inviting to children. Moreover, art museums favor visitors with strong visual-spatial and aesthetic senses. Art museums can become more inviting if they replicate children's museums. Gardner proposes that museums "mount a gallery where youngsters can explore less fragile or less costly works of art."<sup>15</sup> Essentially, discovery rooms can supplement traditional museum displays to appeal to a broad range of intelligences.

Another reason children's museums align closely with MI theories is that they provide visitors with several entrance and exit points. Gardner asserted, "Children's museums, art museums, and other cultural institutions open up a variety of entry points and then, in turn, allow free use of one's own strengths." He identifies seven entry points: *narrational*, *quantitative/numerical*, *logical*, *foundational/existential*, *aesthetic*, *hands-on* and *social*. *Narrational* entry points

engage visitors who prefer to learn through stories. *Quantitative/numerical* entry points address visitors that are intrigued by numbers and the patterns they make.

*Logical* entry points attract people who think deductively.

*Foundational/existential* entry points appeal to those who prefer fundamental kinds of questions. *Aesthetic* entry points favor those inspired by works of art or balanced, harmonious compositions. *Hands-on* entry points invite people who are fully engaged when building or performing an activity. *Social* entry points satisfy needs for socialization, assuming different roles and observing others’

perspectives. Built on the concept of entry points, Project MUSE (Museums Uniting with Schools in Education) is a Harvard University School of Education project associated with Gardner’s theories. The basis of this project is to provide questions, alongside artwork, that provide narrative, quantitative, logical, aesthetic and hands-on entries into the collection.<sup>16</sup> Gardner’s suggestions – to add multiple entry points and provide an interactive gallery for exploration and discovery – are easily applicable to other museum types as well.

Similar to Gardner’s belief that motivation triggers growth of the intelligences, University of Chicago professor and educational psychologist Mihály Csikszentmihályi presents his concept of “flow,” which also has direct implications for learners. “*Flow* is a spontaneous and automatic state of mind where a person – fully absorbed in an activity for which they have a strong interest and curiosity – experiences a heightened level of concentration and focus,

loss of self-consciousness, distorted sense of time and increase in personal control.” This is similar to the experience that an artist or athlete may feel when he or she is actively creating or performing. Characteristics of a *flow* experience include having clear goals, appropriate rules, balance between a challenge and person’s abilities, immediate and unambiguous feedback and intrinsic rewards.<sup>17</sup> Personal growth occurs during *flow* because in order to maintain the flow state, skills must increase along with the increasing of challenges.<sup>18</sup> This correlates to Dewey’s idea of Inquiry Learning. Museums can capture the *flow* experience to inspire visitors to see the relationships between museums and the outside world. By encouraging visitors to uncover these connections, museums can awaken a sense of curiosity and joy in discovery.

Making personal connections to the outside world is the basis of Hein’s notion of a constructivist museum. It is his personal adaptation of the theory of constructivism as attributed to Jean Piaget and applied to museums. In *Learning in the Museum*, Hein discusses theories that underlie the educational importance of social interaction and learning through discovery. Hein argues that learning in museums happens when visitors construct their own understandings and associations, thereby manipulating the environment and making discoveries on their own. Constructivist learning requires: 1) the learner to participate actively, and 2) the learner’s conclusions to correlate to his or her constructed reality, further validating previous knowledge.

In a constructivist exhibition, visitors must “use both their hands and minds, to interact with the world, to manipulate it, to reach conclusions, experiment and increase their understanding; that is, their ability to make generalizations about the phenomena with which they engage.”<sup>19</sup> Other characteristics of constructivist exhibitions include: having many entry points; appealing to a variety of active learning modes; presenting various viewpoints; forming connections between visitors and objects using past experiences; and providing opportunities for experimentation, conjecture and formulating results.<sup>20</sup> Although this exhibition style contrasts with traditional views that exhibition designs should be more static, it is based on Inquiry Learning and therefore builds upon Dewey’s principles of education and experience. Moreover, constructivist exhibits target a wider range of visitors by presenting multiple perspectives and appealing to different learning styles, thereby enhancing visitor experience. Hein frequently cites San Francisco’s Exploratorium as an example of an institution that promotes constructivist exhibitions.

Kodi Jeffery-Clay believes that museums are ideal constructivist environments because they allow visitors to explore freely, move at their own pace, interact and share experiences with groups, and examine and expand their own understanding.<sup>21</sup> Echoing the theories of Dewey and Gardner, Jeffery-Clay asserts that learners have a complex yet organized knowledge structure. New information is connected and linked onto pre-existing knowledge. In order for

learning to be meaningful, a learner must restructure and rearrange previously associated concepts. These resulting concepts are “more stable and more accessible, since they are linked to a greater number of other concepts and prepositions.”<sup>22</sup> Misconceptions and misinformation may be difficult to correct and replace. In fact, information may be rejected if it does not conform to a learner’s prior understanding. A museum must acknowledge this active process and present concepts that are linked to each other or to familiar experiences in order to provide high-quality learning experiences.

Museums can help shape visitors’ experiences by creating interactive situations that “pique their curiosity, encourage them to investigate and make comparisons to their own lives and experiences.” Studies of visitors have noted that people tend to follow their own interests and personal agendas, which includes concepts they have previously experienced. “Visitors seek relationships to their own knowledge and experience.”<sup>23</sup> Studies have also noted the social nature of learning, implying that museums should provide interactive situations that not only allow for free choice but also for socialization. When working in groups, adults or experts can aid those less skilled or knowledgeable. Past studies revealed that children who engage in social learning activities increase their likelihood of transferring new knowledge to subsequent situations.

Jonathan Osborne challenges Jeffery-Clay’s view of museums as ideal constructivist learning environments. He argues that museums are complex

learning environments, yet not enough is known about museum learning to warrant Jeffery-Clay's viewpoint. Not only is it difficult to measure what people learn in museums, but it is also questionable to measure whether learning actually occurs. Moreover, Osborne claims that Jeffery-Clay's article does not answer the most burning question – what kinds of experiences are necessary to restructure knowledge? The claim that learning is achieved by doing oftentimes is confused with the idea that learning *is* doing. Also, it neglects the fact that exhibits construct a story; objects alone cannot speak for themselves. According to Osborne, an effective exhibit utilizes various communication tools to speak in a clear and authoritative voice, declaring that the museum's interpretation is valid and one of expertise.

Jeffery-Clay proposes that museums encourage families to learn in a group, having the more knowledgeable members acting as aids or facilitators for the group's learning. However, Osborne's visitor studies have shown this learning strategy is underused by families and school groups. Not only will constructivism not solve these complex problems, but it also offers few concrete suggestions for exhibit designers and educators. Osborne proposes that museums look at constructivism in terms of communication. When each party understands each other's viewpoint, successful communication has occurred. Therefore, museums should know about their visitors, especially how exhibits will be commonly interpreted. "To teach a learner about science it helps not only to know something

about science but also to know something about the learner.”<sup>24</sup> Osborne proposes that museums disregard the notion of constructivism and instead “attempt to encourage the visitor to focus, recapitulate, and review.”<sup>25</sup>

The notion that learning is socially constructed is attributed to psychologist Lev Vygotsky. In *Mind in Society*, he discusses another theory of development that is relevant to the museum field. Vygotsky argues that learning occurs in the presence of the *zone of proximal development* (ZPD). ZPD is the distance between one’s actual and potential development. Determined by independent problem solving, actual development is the level of existing mental functions as a result of development. If the child can perform a task independently, then her skills and abilities to perform such a task have matured. Potential development is what can be solved under the guidance or collaboration of an adult or more capable peers.<sup>26</sup> Assistance and guidance from the adult or expert is called *scaffolding*.

ZPD defines functions that have not yet matured but are in the process of maturation. That is to say, learning is a “variety of internal developmental processes that are able to operate only when the child is interacting with people in his environment and in cooperation with his peers. Once these processes are internalized, they become part of the child’s independent developmental achievement.”<sup>27</sup> Initially, children learn best in a social setting with an adult or more skilled person.

## **Family Learning In Museums**

In the last twenty years, museums have begun to apply and integrate theories such as scaffolding, constructivism and multiple intelligences as well as research on family learning. For the purposes of this master's project, my definition of "family" is an intergenerational group of two or more casual visitors consisting of at least one adult aged eighteen years old and one child. Given the plethora of literature, I will focus on articles published in the past two decades. However, there are a few notable articles prior to 1990.

One such article, *How Families Learn: Considerations for Program Development*, demonstrates that behavior of family visitors in museums aligns with learning theories, in particular Vygotsky's notion that learning is a social experience. The primary reason families visit a museum is social interaction, although they expect a learning experience as well. They prefer interactive, hands-on experiences and exhibits that allow for the family to learn as a social unit. Marcia Krompf and Inez Wolins suggest that, to respond to family needs, a museum should provide problems and activities that can be performed as a group, promote conversation and discussion, are open-ended and begin with familiar content. Krompf further suggests that education activities be designed to: offer challenges; evoke curiosity; offer ways to actively participate; and allow to practice skills and concepts.<sup>28</sup> The goal of museum education should be "to teach

a limited number of specific skills in ways that allow the visitor to independently use the museum as an educational resource.”<sup>29</sup>

In *The Family Museum Experience: A Review of Literature*, Krompf summarizes six studies on family visitors focusing on exhibits, labels and educational materials. They include: 1) Deborah Benton’s study of 25 adult-child visitor groups at specific areas of four New York City area museums, 2) Robert Wolf and Barbara Tymitz’ study of 300 visitors at the National Zoological Park in Washington, D.C., 3) Sherman Rosenfeld’s study of 80 family groups at the San Francisco Zoo, 4) Judy Diamond’s study of 28 family groups at the Lawrence Hall of Science and the Exploratorium in the San Francisco area, 5) D.D. Hilke and John Balling’s study of forty-two family groups in a traditional exhibit hall, and 6) Samuel Taylor’s study of twenty-five family groups at the Steinhart Aquarium in San Francisco.

All of these studies revealed similar patterns. During the earlier stage of their visit, families devote a lot of time to viewing exhibits and reading labels. The amount of time spent at each exhibit decreased as the visit progressed and museum fatigue set in. Families were attracted to and spent the most time at exhibits that were interactive and participatory, such as those that allowed touching and encouraged physical activity. Families avoided crowds and only viewed an exhibit if there was enough empty space for the entire family. As with exhibit viewing, the “amount of reading and the amount of describing decreased

as the visit progressed.”<sup>30</sup> Families wanted to read text with simple and concrete information about what was on display. Families were interested in concrete aspects of the exhibit yet most labels discuss abstract concepts. Although parents modeled museum behavior of how to read labels and what to look at, teaching was a reciprocal activity. “Different family members teach in different contexts,” explains Judy Diamond. Both the adult and child take turns acting as the teacher. Adults typically share symbolic information gained from the text or their past experience. Meanwhile, children teach adults and other family members how to use an exhibit or explain what phenomena is displayed

Researcher Lynn Dierking, in her 1989 article *The Family Museum Experience: Implications from Research*, reinforced the notion that museum visits are social events where families interpret exhibits concretely. Dierking revealed three more implications for museum educators. Museums should accommodate the family’s basic needs, which includes wayfinding, rest stops and the gift shop. Educators should keep in mind that families come to look at exhibits and might view programs as a diversion from their goal of viewing the exhibits. Lastly, museums should provide a variety of options that accommodate different learning styles, knowledge levels and attention spans. In order to understand family visitors better, museum staff should spend time in the galleries, speak to visitors, or conduct a survey or focus group.<sup>31</sup> Both Dierking’s and Krompf’s review of past research on family learning in museums reveals that the *main* reason families

visit museums is to have a social experience. Many others agree that museums should foster this social learning dynamic by providing opportunities for group activities and discussions.

The Family Learning Project conducted in 1998 by the Philadelphia Informal Science Education Consortium, known as the PISEC study, is the most important study to date on family learning in a science museum. Family visitors to four Philadelphia area institutions – the Franklin Institute, Academy of Natural Sciences, New Jersey State Aquarium at Camden and Philadelphia Zoo - were examined. The study identified seven characteristics of successful family exhibits: *multi-sided, multi-user, accessible, multi-outcome, multi-modal, readable and relevant*.<sup>32</sup> These characteristics facilitate successful family learning by addressing the family's social, cognitive and personal needs. Although “rarely are present in any one science museum exhibit,” this guideline for family-friendly exhibit development can be applied to museums of many disciplines.<sup>33</sup>

Half of the family-friendly characteristics identified by the PISEC Study – *multi-sided, multi-user, accessible and multi-outcome* – are specifically related to a family's social needs. As suggested by the study, exhibits should allow for small and big hands along with varying heights and physical abilities to comfortably and easily view and interact with the exhibit. In addition, these interactions should be complex and open-ended enough to foster group discussion and teacher-student roles. Further adding to the body of literature about family social learning

in museums, Doris Ash has studied families' conversations occurring in front of dioramas at the Natural History Museum of Los Angeles County. Her research revealed that parents used questioning as a strategy to help their children clarify their thinking and "*scaffold* their understanding."<sup>34</sup> Moreover, these questioning strategies could be divided into three processes: 1) attempting to make sense of what they see, 2) co-constructing meaning and 3) inviting others into the discussion via dialogue that uses prior knowledge, open-ended questions or questions that invite further explanation.

Kevin Crowley also emphasizes that parent participation deepens the child's engagement with the exhibit by guiding the activity and constructing explanations.<sup>35</sup> If the target audience is children, the exhibit must also engage the parent in collaborative learning. A child is able to build skills and construct knowledge through group discussion and shared experience with a parent. Linda Blud affirms this statement and claims that the presence of an adult, regardless of their ability or prior knowledge, is able to help a child understand the exhibit's underlying concepts. Interactive exhibits are successful in creating a constructive social exchange between parent and child, which contributes to the educational effectiveness of an exhibit.<sup>36</sup>

According to Dierking, parents benefit from socially mediated learning activities alongside children. Parents who learn with their children gain confidence, as well as knowledge in how to answer or find answers to their

children's questions and create more learning opportunities for their children. Dierking applauds *ArtQuest*, an interactive education gallery at the Frist Center for the Visual Art in Nashville, TN, as a successful strategy for collaborative learning because it allows small groups to work and interact with each other. To Dierking, the gallery is an interactive space where families can "gain a deeper understanding of a topic by providing them with opportunities to touch and examine objects, documents and other materials."<sup>37</sup>

Museum docents, staff and volunteers can also facilitate group discussion and learning within families. Krompf found that interaction – among visitors, visitors and staff, or visitors and living collections – is key to attracting and holding the attention of family members. PISEC Project Director Minda Borun found that interaction with staff "correlated with a higher number of performance indicators in the treatment group"<sup>38</sup> As part of the Institute of Museum and Library Services (IMLS) Education Interpretive Project for the Speed Art Museum in Louisville, KY, Marianna Adams and colleagues at The Institute for Learning Innovation prototyped new interpretive strategies geared toward families. When families were asked to describe what they liked about the discovery cases, many commented that they enjoyed having a staff person with whom to interact. "Having a docent facilitator also took the pressure off parents so that children and adults could be co-learners in the experience."<sup>39</sup>

The PISEC study identified that *multi-modal* and *readable* exhibits would address the diversity within families by attracting and appealing to different learning styles and levels of knowledge. A multi-modal exhibit would “appeal to visual, verbal and participatory (kinesthetic) learners and contains activities that communicate at a lower-elementary level.”<sup>40</sup> Borun considered text readable if it was written in simple language and divided into easily-understood segments.

In the mid-1990’s, The Queensland Museum in Australia studied ten families to understand how to build and empower its family visitors. The implication of the study is that “exhibitions need to be created for multiple paths, that work on a multitude of levels which relate to visitor’s different interests and knowledge.”<sup>41</sup> Suggestions include opportunities for self-expression, physical exploration and play. Marianna Adams agrees that variety is the key to addressing the range of abilities, interests and needs of the audience. Prototype testing of the discovery cases, gallery packs and gallery guides revealed that visitors enjoyed activities that were self-evident and hand-on. They also requested more sensory experiences and varying levels of difficulty.<sup>42</sup>

Text and graphics help explain, guide or inform the visitor about an exhibit, activity or concept. Borun reveals that enlarged text and titles increases the attracting and holding power of the graphic. All graphics should be placed directly in front of the visitor with simple commands, like “match,” in bold. Visitors were more likely to read short labels that start with a question or

challenge. For interactives, text has to clearly state what the visitor is expected to do. The interactive itself has to be simple with only a few, clearly stated instructions. It is essential to prompt and prod visitors to touch and interact with the exhibit. With the presence of straightforward directions, such as “the phrase “lift and look” families are cued to correct visitor behavior.<sup>43</sup>

Anne Henderson and Susy Watts found similar results in their field test of the Frist’s *ArtQuest*. They believe that concept-based education is the educational philosophy supporting the rationale for having an interactive gallery in an art museum. They discovered that families desire clear, focused and simple language as well as images, color and highlighted key words/concepts to help ease understanding of text. In addition to findings about text, Henderson and Watt discuss the success of *ArtQuest*, which allows families to work in small groups to experiment and learn about art in a hands-on fashion.

Supporting Dewey and Gardner’s philosophies, PISEC identified that exhibits should be *relevant*; that is, able to personally motivate and interest visitors by providing a cognitive link to past knowledge and experience. The Speed Art Museum was able to provide visitors with real-world connections through activities in conjunction with the discovery cases. Adams noted that hands-on experiences held the visitors’ interest and helped them focus, spend more time at the exhibit and look more closely. Dioramas and immersive

environments, argues Ash, allow visitors to instantly connect their everyday experiences with more formal structures.

The seven family-friendly exhibit characteristics identified by the PISEC study hold true throughout current studies on family learning in museums. Yet despite the consistent findings of researchers that visitors follow their personal agenda, Baillie and Dierking believe that museums tend to impose their own agenda thereby ignoring their visitors' needs and motivation. Baillie's study pays homage to researcher Lois Silverman's argument that museums should validate opportunities for personal meaning making and expression of identity. One way to address all the characteristics is to create an interactive space for families.

In June 2005, more than 160 museum educators, designers, researchers, architects and consultants attended the J. Paul Getty Museum Symposium, *From Content to Play: Family-Oriented Interactive Spaces in Art and History Museums* in Los Angeles. These museum professionals revealed that interactive spaces successfully supplement the museum's educational offerings to appeal to a wider audience of varying learning styles. In essence, discovery rooms closely align to learning theories and characteristics of family-friendly learning environments. They can provide visitors with social learning experiences that address multiple intelligences, prior experience and personal motivation. Adams and Jessica Luke synthesized the issues and strategies of creating an interactive space into a three-part framework: 1) *Heart* qualities – vision and intention, 2) *Head* qualities –

visitor experience and learning, organizational and professional values, and 3) *Hand* qualities –logistics and implementation of vision and ideas. Families' experiences in museums are unique, they argue, and therefore require "a special space for them in order to meet their needs and accommodate their unique learning processes."<sup>44</sup>

### **Family-Oriented Interactive Spaces**

Several studies on family learning in museums have shed light on discovery rooms as method to address intergenerational visitors. I define "discovery room" as a separate, publicly accessible area within the context of a traditional museum that features activities, objects, artifacts and exhibits to provide visitors with interactive, discovery experiences. The first family-oriented interactive space was the *Discovery Room* at the Smithsonian National Museum of Natural History (NMNH). The room grew out of an effort to improve a small exhibit for the Anacostia Neighborhood Museum in Washington D.C. Psychologist Caryl Marsh advised the Smithsonian on how to redesign activity boxes for this exhibition. She suggested that the NMNH create a more structured setting for the activity boxes in order to provide visitors with hands-on experiences with the collection.<sup>45</sup> With funding from the National Science Foundation, Marsh, along with children's museum educator Judith White (Marcellini) developed the first discovery room in 1974. It was a space in which

families could participate in self-directed, self-paced activities that offer a chance to touch and handle museum specimens.

In NMNH's *Discovery Room*, visitors set their pace with intense and focused activities or via undirected and unstructured exploration. To this day, it is a perfect location for small children to get a taste of a museum experience and older children to examine objects and arouse interest in the collection. Museum volunteers staff the room and act as assistants, not instructors. Games in the room include matching, guessing and comparing activities.<sup>46</sup>

The *Discovery Room* was so popular and active that within eight years, the National Museum of American History opened a "Hands on History Room" and the National Zoo created three additional discovery rooms, *ZOOlab*, *BIRDlab* and *HERPlab*.<sup>47</sup> Inspired by NMNH, the American Museum of Natural History (AMNH) in New York opened its *Discovery Room* in 1977. AMNH's space differed from NMNH's because they used label text that was short and simple, assuming that visitors had a shorter attention span. Because a carpeted platform was so popular at NMNH, AMNH designed all seating to be on carpeted platforms. This encouraged children to spread out, as they might do at home. In contrast to NMNH, AMNH chose larger specimens over smaller objects. It opted against having a live collection of plants or animals due to staff-intensive care and upkeep. Observations of visitors noted that the *Discovery Room* enhanced and

increased the “proportion of visitors who will understand a principle and/or absorb some factual information.”<sup>48</sup>

Several other institutions soon followed suit. These interactive spaces are environments in which to slow down and participate in activities, stimulating visitors to think and look. Not only do these spaces encourage the process of discovery, but ultimately they strive to allow visitors to become more involved and actively participant in their own learning. By 1999, according to Wendy Pollock of the Association of Science-Technology Centers, 100 of their member institutions had at least one discovery room. Pollock notes that visitors seem to remember their discovery room experiences long after the visit and continue their learning at home. They not only speak about what, but also *how* they have learned.<sup>49</sup>

Conceived after a visit to NMNH, the California Academy of Sciences (CAS) opened a *Discovery Room* in 1978. CAS wanted to provide children with direct encounters with natural objects, free from adult interpretations. According to CAS’s cast study, the most popular objects were the discovery boxes (seventy-seven percent), costumes (twenty-six percent), puzzles (sixteen percent) and a human skeleton (eleven percent).<sup>50</sup> Visitors ranked touching and investigating objects as their most favorite activity. Because children spent three times as long in any activity and engaged in more extensive explorations in the presence of an

adult or peer, the exhibit areas invited social interaction and open-ended opportunities.

The *Discovery Gallery* at Toronto's Royal Ontario Museum opened in 1983 was discovery oriented rather than activity oriented. Like other interactive spaces, its goals were to create interest, use a variety of senses, and provide wide access and close examination of the collection. A visitor study revealed that advertising was important to inform the public about the gallery and that the space is for all ages. Most visitors found out about the gallery space through word of mouth. Even though the majority of visitors thought the gallery was for children, eighty-nine percent of adults enjoyed their educational experience and would return for another visit.<sup>51</sup> Visitor suggestions for improvement included more changing exhibits and text that appealed to varying ages and intellectual levels.

With the opening of the Getty Center in 2004, the *Getty Family Room* relocated from the Getty Villa and was renovated. The Getty's Education Specialist for Family Audiences Rebecca Edwards notes that family-oriented interactive spaces like the *Getty Family Room* are able to address family needs that traditional galleries have been unable to achieve. Although the space operates under goals that differ from the rest of the museum galleries, it provides an ideal environment for family learning. Results of a 1999 evaluation revealed four priorities for an interactive family gallery: "1) hands-on activities and opportunities to touch, 2) things to do that are fun and entertaining, 3) self-

directed activities for learning about art, and 4) a place to rest, relax, and “let off steam.”<sup>52</sup> The Getty was intent on creating a gallery that was intuitive and did not rely on language to convey ideas. It would be self-directed, bilingual and provide an outlet for children with high energy levels. Based on the theories of Dewey, Gardner and Vygotsky, the gallery allows for small group collaboration and connections to personal context.

Although learning theories and literature about family learning in museums have supported supplementing traditional exhibits with hands-on, interactive experiences, not everyone agrees that museums need an interactive learning space. Adams and colleagues discuss problems that may occur when such spaces are located within a “no touch” art museum environment. The dilemma is how to introduce hands-on activities that promote connoisseurship and do not encourage visitors to touch the artwork in the other galleries. By using art replicas, some museums feel that they are teaching visitors that certain pieces of art are not as important as others. Other problems mentioned are: damaging objects through improper handling; confusing interactive components with interactive artwork that is not meant for touching; and utilizing play for fun instead of as a tool for learning.<sup>53</sup>

Optimal learning, Dewey believed, depends upon the learner being fully engaged or as Csikszentmihályi suggests, experiencing *flow*. As informal learning environments, museums can create exhibits that encourage exploration of thinking

and reflection. In 1991, the American Association of Museums (AAM) defined *museum* “as institutions of public service and education...[places for] exploration, study, observation, critical thinking, contemplation and dialogue.”<sup>54</sup> Museums are realizing their educational role and duty to society and thus are re-evaluating how visitors experience exhibitions. Educational reform in museums stresses the need to provide visitors with multiple entry points and acknowledge different learning styles.

While the rationale to create a discovery room is consistent with the findings of visitor research and literature mentioned above, few examples or practices are mentioned in discovery room case studies. Literature does not discuss the logistics or pragmatics involved with creating discovery-based experiences that appeal to a range of ages and abilities. For discovery rooms to actively attract, engage and cultivate intergenerational learning, further research is necessary.

## Findings

My second phase of research examined the current state of discovery rooms through a survey of California museum educators; site visits to discovery rooms in three Southern California museums; interviews with eleven exhibit designers from private firms across the U.S.; and interviews with twelve museum professionals, including museum consultants, educators and in-house exhibit designers who have created discovery rooms for families. The findings of my research answered six main questions: 1) how does the profession define *discovery room* 2) why do museums create discovery rooms 3) what are the resources needed for a discovery room? 4) what are the design issues involved in creating a discovery room? 5) what learning theories and educational goals inform discovery rooms, and 6) who creates discovery rooms?

I learned that discovery rooms are prevalent in museums in California and that they vary widely on approach and characteristics. Most of these institutions are hiring outside exhibit design firms to help create the space. Over half of the museums surveyed had a discovery room or were planning to open a discovery room in the near future. Forty-four percent of these museums used outside designers, whether in conjunction with their in-house exhibit designers or relying entirely on the private outside firm to design the discovery room.

### **How is *discovery room* defined?**

Terminology, such as *discovery room* and *interactive*, has various meanings in the museum field. Definitions varied within institutions as well as between museums and private exhibit design firms. Prior to devising my survey, I spoke to a San Francisco Bay Area museum professional about the plans for an interactive space in her art gallery. She did not associate her space with my project because her definition of “discovery room” held a different connotation. Although she did not explain her thought process, I think that she saw a discovery room as a place for children to *touch* and closely examine objects. Also, there is a historical connection of discovery rooms in natural history museums. For these reasons, I chose to use the more neutral term “interactive exhibition space” on my survey. Likewise, the term *interactive* has various connotations, including computer technology. Designer Donald Sibbett offered an explanation as to why there is confusion regarding the term: “*interactive* was originally part of the museum world and was applied to science museums.”<sup>55</sup> He continued, asserting that the definition became distorted during the dot.com era because websites and computer programs were understood to be interactive. He considered this technology to be multimedia programs and not *interactive* in the sense that museums use it to embody the theories of Dewey and other educational theorists discussed in the Literature Review. Thus, there are still misunderstandings about the terms *discovery room* and *interactive*.

Beyond definitions of terminology, museum educators and exhibit designers also understand the concepts differently. Exhibit developers declared that museums know they want interactivity but do not understand exactly what it means. Museum educators have a very basic understanding of the term. On the other hand, exhibit designers had specific and concrete ideas about how *hands-on* and *interactive* relate to exhibit design. Sibbett did not believe in the notion of being hands-on, but rather, thought that there are two types of interactives: passive and active. Passive interaction involves touching and looking at details, while active interaction requires gross motor skills and cause and effect. Similar to Sibbett, Tim Smith, Senior Designer for One + Two, Inc., also categorized levels of interaction. For him, the true meaning of interaction involves how visitors use the exhibit and their level of engagement. Tim Smith stated “many people consider simply pushing a button or turning a crank to be “interactive” and ... that’s an inaccurate perception.” But for true interaction to occur, he argued, an interactive must encourage analysis and testing of a hypothesis. Moreover, he believed that *hands-on* is a nebulous term, which may sometimes mean *interactive*. Two other designers told me that *interactive* is simply a buzzword that is understood differently depending upon who you speak with.

### **Why do museums create discovery rooms?**

No matter how it is defined, museum educators are enthusiastic about discovery rooms and interactivity. Discovery rooms are prevalent in many types of traditional institutions, from art to anthropology to aircraft museums. No matter what their collection type, institution size or location, fifty-eight percent of respondents indicated that they have a discovery room or some version of interactivity in their various museums. An additional thirteen percent are in the process of planning or creating one, including one museum that will open an additional discovery room. Moreover, the amount of space devoted to a discovery room is fourteen percent of the total exhibition space or roughly an average of 2,600 sq. ft.

In addition to being devoted to a range of collections and themes, discovery rooms target a broad audience. One-third of museum educators identified family groups as their target audience and an additional twenty-five percent of respondents listed the general visitor. In other words, museum educators indicated that their discovery room was not designed solely for children. In fact, the very first discovery room at the National Museum of Natural History (NMNH) was originally intended for visitors of all ages. Caryl Marsh, who created the blueprint for NMNH's *Discovery Room*, emphasized to me that the first discovery room was “*clearly* designed for everybody” and not just adults with children.<sup>56</sup>

Yet, I got the impression that museums need to better represent discovery rooms as spaces for intergenerational learning as opposed to a place for children. Essentially, the general audience is not being sufficiently addressed or engaged. Judith White (Marcellini), co-creator of NMNH's discovery room, reflected on this issue. She explained that the original *Discovery Room* at NMNH offered "opportunities to provide experiences for...families and mixed age groups of adults and children." She regretted to say that nowadays museums have forgotten their responsibility to parents or adults without children: discovery rooms have "somehow (mistakenly) considered themselves more for children," which she does not consider purposeful.<sup>57</sup> Additionally, one Director of Education revealed the difficulty involved in getting other staff members to understand that their discovery room is for the general public. She remarked, "I call [our discovery room] the Interactive Gallery, many still call it the Children's Play Area, unfortunately."<sup>58</sup>

Nonetheless, opening an interactive exhibition space for the family audience showed positive effects by altering demographics. With the opening of a discovery room, museums increased their family visitation, boosted sales of family memberships and brought in a more diverse audience. Diadre Metzler, Director of Education at the Fresno Metropolitan Museum, remarked, "we work to appeal to a broad audience, [one that is] representative of our ethnic demographic."<sup>59</sup> Vas Prabhu, Deputy Director of Interpretation and Public

Programs at the Peabody-Essex Museum, viewed remarkable results because of the addition of a discovery room. Within the first year of opening its space, *Idea Studios*, family visitorship to the museum increased by an astonishing three hundred percent. It became commonplace to see parents with children and grandparents with teenagers coming to the museum to visit the discovery room. *Idea Studios* brought in more ethnic and cultural diversity and the average visitor had a slightly younger profile. In contrast, an educator from one undisclosed museum confided in me that the closing down of her institution's discovery room was "devastating to the daily attendance...families had *no* reason to come."<sup>60</sup>

### **What are the resources needed for a discovery room?**

There are a range of characteristics and resources that exhibit designers and developers consider when developing a discovery room, including staffing and evaluation. Most exhibit designers and museum educators agreed that discovery room staff is necessary to improve the general visitor's experience. Nearly three-fourths of museum educators identified that they staff the discovery room during *all* public hours. Having a staff presence in the room was so important to museum educators that it did not matter if the staff was paid or volunteers. Exhibit designers agree that staffing is an essential part of the discovery room experience. Sari Boren, Principal and Exhibit Developer at Wondercabinet Interpretive Design, Inc., stated that discovery rooms should be

designed with the “potential to expand with a docent.” That is to say, a facilitator in the space can engage families in activities and promote learning behavior but the room can also stand on its own or function without staffing. Boren claimed that staffing is “the *number one* thing that makes or breaks the visit for the museum visitor. Most of the time when you talk to people, they mention their favorite part was their interaction with the staff.”<sup>61</sup>

Because staffing is so important to the vitality of a discovery room, museum educators revealed that discovery room staff receives special training. The top two job responsibilities for discovery room staff are to facilitate interaction with exhibits and engage visitors in active learning. In order to ensure that staff can properly facilitate learning activities, training is necessary. At the Fresno Metropolitan museum, discovery room interpreters are trained over a one-month period. Diadre Metzler, Director of Education at Fresno Metropolitan Museum stated that, “[interpreters] receive considerable training in learning theory, inquiry method, dealing with varied age levels, facilitation of demonstrations, etc.” She explained that discovery room staff is even occasionally “sent to related professional development courses.”<sup>62</sup>

Evaluation is another resource museums allot to discovery rooms yet several exhibit designers doubted the quality of the data received. Eighty percent of the surveyed museum educators evaluate their interactive exhibition spaces and seventeen percent hired an outside firm to conduct the evaluation. Yet, the

majority of museums use in-house evaluators or other staff to evaluate the space on their own and perhaps without training. The evaluation techniques most commonly utilized are visitor surveys and informal methods such as conversations with visitors, observations or guest book entries. Exhibit designer Donald Sibbett argued that most of the information museums receive is purely anecdotal and therefore true “scientific” evaluation is not really performed. Nonetheless, almost all exhibit designers agreed that evaluation is undervalued in the field and should be performed more often. They believed that evaluation is necessary to assess visitor engagement and learning and therefore is the key to successful exhibits.

Exhibit designers and museum consultants offered suggestions on how to afford and perform evaluation. Because museums operate on a limited budget, exhibit designers advocated that museums allocate money for prototyping. Prototyping is “the best method to see what people are taking away...if it is misleading or will alter the perspective of the outcome,” stated exhibit designer Tim Smith. Another exhibit designer agreed that prototyping is essential to see what messages people are getting. She stated that it also allows you to see how quickly the target audience will “mess it up and if the kids will get it.”<sup>63</sup> According to Caryl Marsh, prototyping ought to answer three specific questions: 1) does the visitor accept the invitation to sit down and engage with the activity? 2) are the instructions clear and understandable? and 3) does the visitor follow

instructions and get results, i.e. does he or she walk away with information or understanding?<sup>64</sup> Aside from just prototyping, museums can perform remedial or summative evaluation on a limited income, asserted Froehlich. She suggested that museums pull staff from the education or exhibit design departments to observe visitors in the space. Another option is to use peer review. That is, museums could ask exhibit developers and evaluators from other institutions to give their frank, professional opinions about the discovery room.

Aside from the necessity staffing and evaluation, museum educators did not agree about the characteristics of a successful discovery room. Responses were evenly divided between importance of its location within the museum, “comfort features,” and interactive components. Amelia Chapman, Director of Education at the San Diego Air & Space Museum, remarked that the location of the discovery room near the restrooms and classrooms, as well as being a halfway point of the museum and a prime resting spot was ideal. Vas Prabhu, Deputy Director of Interpretation and Public Programs of the Peabody-Essex Museum in Salem, MA, revealed that by positioning the interactive exhibition space *Idea Studios* off the atrium, “we immediately convey that it is a family-friendly and welcoming space.”<sup>65</sup> Additionally, eighteen percent of exhibit designers were adamant about the need to provide seating. One informed me that some of the seats should have armrests to aid grandparents and visitors when sitting down or

standing up. Other comfort features mentioned were that children could “use these areas safely” and that parents and staff could easily monitor the discovery room.

### **What are the design issues involved in creating a discovery room?**

Exhibit designers could not reach a consensus on what aesthetic will attract families to the discovery room. Yet all agreed against using primary colors in favor of more sophisticated tones that reflect the design of the rest of the museum. Half of all exhibit designers believed that the space should appeal to children but be accessible to adults, while the remaining argued that the space should appeal to adults but be fun and inviting to children. Addy Froehlich, Exhibit Designer for Lehrman Cameron Studio, advised that the look of a discovery room should be fun and appealing for kids but with a color scheme and materials that will not “turn away adults.”<sup>66</sup> Abby Kliger, Associate Designer for Pacific Studio, agreed and stated that certain color tones make “kids excited to touch and interact with the exhibit.” She noted that making a space visually appealing to children can “bring out the kid in adults.”<sup>67</sup> Alternatively, Sibbett stated that he prefers to design spaces that are kid-friendly but visually appealing to adults. Prabhu also did not use “kiddie colors or furniture” because she wanted everyone to feel welcome.<sup>68</sup> Moreover, Peter Exley, Director of Architecture for architectureisfun, Inc., mentioned that aesthetics are not a problem because good designers know how to create beautiful and inviting spaces.

Several museum educators as well as the majority of exhibit designers attributed a successful discovery room to open-ended and multi-leveled activities and exhibits, a belief that supports the findings from the PISEC study. The *Boone's Children's Gallery* at the Los Angeles County Museum of Art (LACMA) attributed its success to the myriad of open-ended activities, as well as the physically and intellectually multi-leveled components, all of which encourage social interaction. Similarly, designers emphasized that the space should allow for individual and social experiences. Moreover, Sibbett urged museums to build components that allow the visitor to walk up to it and know how to do it. Yet, he continued, the activity needs to contain a level of challenge, should not provide the visitor with wrong answers, nor be impossible. Further echoing some of the themes discussed in the Literature Review, Kliger stated that “discovery room components can provide experiences that a visitor figures out using deductions, reasoning and play as opposed to being fed an answer.”<sup>69</sup>

Exhibit designers also agreed that text for families in discovery rooms has to be simple and information should be layered. Addy Froehlich urged museum educators to use text that is short and simple and stay away from long blocks of text, densely packed with information. Similarly, Kliger pleaded: “Often, the less information is given, the more information is conveyed. It is important not to sacrifice content, but condensing information into main points helps to get information across.” She advised using text for families that is simple for the kids

yet provides enough information for “adults to read in order to help explain to a kid or for them to understand in-depth.” Klinger also noted that because visitors do not spend too much time reading, the first line of text should be the thesis and information should be broken up into bits.<sup>70</sup> One method to layer information, according to Tim Smith, is to tier the content of the text panels. He suggested beginning with a paragraph geared towards elementary school level reading with the subsequent paragraphs becoming more detailed and technical.

### **What learning theories and educational goals inform discovery rooms?**

The majority of museum educators could not clearly articulate the educational theories or principles that guided the development of their discovery room. Nearly two-thirds of museum educators could not specify names of theories or educational philosophers. In my survey, I asked museum educators what influenced the development of the interactive exhibition space. One Curator of Education explained, “I couldn’t remember a name to say. We forget theories once out of school and use best practices.” While unable to cite specific theories, museum educators agreed that museums should appeal to varying modes of learning and understanding. Most were able to mention ideas and terms related to a theory, such as providing hands-on activities, creating opportunities for social learning and addressing individual differences. Out of the influences mentioned by name, the most cited included: John Dewey, Howard Gardner, George Hein,

and educational researchers John Falk and Lynn Dierking. Additional influences cited included: Reggio Emilia - an Italian city that implemented a project-oriented approach to preschool curriculum post-World War II; Lev Vygotsky; Jean Piaget; and evaluator and museum consultant Beverly Serrell.

Surprisingly, when asked the same question, most exhibit designers were able to cite specific theories by name, unlike the museum educators. While one might assume that museum educators would seemingly be the experts on visitor learning and educational theories, the exhibit designers with whom I spoke are more conversant and better informed. Perhaps this is because educators balance their time and efforts between various projects whereas designers and consultants are constantly focused on the bigger picture. However, several exhibit designers deferred to the museum educator as being more eloquent, “educators can speak better to theories.” One quarter of designers revealed that they always look towards the museum education staff for guidance as to which approach to use in the project. Exhibit designers listed Dewey, Hein and Gardner’s theories as their main guiding ideas on education and learning. Additionally, Piaget and visitor studies, such as the PISEC study, also informed their ideas on family learning.

Given the wide range of educational theories and principles cited, museum educators had varying educational goals for the discovery rooms. Educational goals ranged from the vague and vacuous to “make people curious” to concrete responses grounded in educational theory. The educational goal of the Getty

Museum in Los Angeles is “to provide a hands-on environment for family exploration that engages adults and children in meaningful interactions which lead to multifaceted discoveries about the Getty collection.”<sup>71</sup> Another museum, the San Diego Air and Space Museum designed their discovery room with Vygotsky’s theories in mind. The space was created to supplement the “no touch” didactic quality of the museum by offering space for families to explore and learn together as a social unit. Given the spectrum of responses, most fell into three categories: 1) Discovery – exploring, following curiosity, being engaged and uncovering challenges, 2) Interaction – touching objects, hands-on activities and kinesthetics, and 3) Understanding – creating connections between activities and the collection.

### **Who creates discovery rooms?**

Although museum educators and exhibit designers agreed that the team approach to design a discovery room is ideal, what differed is ideas about who should be on the team and who has input in the process. However, both agreed that educators and curators are essential team members. Exhibit designers offered reflections as to why it is important to involve representatives from the education and curation departments. They stated that the education staff, including docents, understands the audience: how they learn, what they like and what “works” with different types of people. Additionally, curators are important to the team because

they are content experts who presumably understand the history and stories that the collections can tell.

When exhibit designers are given the chance to design their “dream team,” they selected additional members from various departments. Roles and titles vary from museum to museum, but designers stress the need for three more perspectives: collections, facilities and maintenance, and marketing and administration. First of all, an overwhelming majority of exhibit designers wanted to involve collections staff in the project team despite the fact that over ninety percent of museum educators did not. The exhibit designers saw value in hearing the opinions of staff who know what objects are in the collection and have an intimate understanding of them. Secondly, exhibit designer Tim Smith stated that the space must align to how the rest of the museum is maintained and this maintenance should match staff resources. Therefore, it is essential to understand viewpoint of facilities and maintenance in order to ensure that the space will last as long as possible. This is especially important given that visitors are, in the words of one of my interviewees, “rough and tumble and will tear [the discovery room] apart.”<sup>72</sup> Lastly, Sara Smith, Director of Exhibit Development at Amaze Design, encouraged input from administrators about “branding, museum identity, goals for audience numbers and the bigger perspective for why you are doing this project.”<sup>73</sup> Architect and designer Peter Exley summed it up the best: we want to

work with “a strong, committed, diverse group that represents the museum; they must be good communicators to the institution as a whole.”<sup>74</sup>

When working with museums to create a discovery room, exhibit designers identified that communication was a major challenge but could be solved through leadership. Without project team leaders, it was hard for exhibit designers to communicate with museum professions and oftentimes create a disconnect between design firm and museum. Moreover, issues such as the project timeline and budget could be rectified if a museum appointed a project leader. Exhibit designers revealed to me their frustration in working with a museum that did not appoint a project leader, decision maker or contact person. Exhibit designer Abby Klinger confirmed the difficulty working with clients who have not established a project team or criteria on which to make decisions. Without defined leadership, she warned, there can be a disconnect between the designer and other project team members. She continued, project leaders are “the link in facilitating communication to make sure all education needs are met in the final design.”<sup>75</sup> Project managers can also ensure that deadlines are met, the project is on schedule and that both parties understand each other. In summation, exhibit designers wanted to work with a project manager who incorporates the ideas of his or her coworkers and communicates the impact a discovery room will have on the staff’s job responsibilities.

Another challenge exhibit designers faced when creating a discovery room is when the museum lacks a cohesive vision and master plan for the project. According to exhibit designers, articulating a clear vision for the project is a primary step in the design process. Museums often skip this step although it is their responsibility to create clear goals for the audience, what they are trying to accomplish and why. Without a vision statement or exhibit main message, explained exhibit designer Addy Froehlich, the exhibit team can “easily become lost in the details of planning and creating an exhibit.”<sup>76</sup> Two exhibit designers offered explanations as to why museums do not create a master plan. One firm stated that museums often “do it backwards.” She explained that museums first outline the activities for the space and then create visitor goals, objectives and a concept narrative.<sup>77</sup> Another explanation, given by Director of Interactive Design Frank Migliorelli, is that museums are not sure what they really want. But Migliorelli has an easy solution; he asks his clients to discuss their voice and mission. In particular, “who you are, where and what you are coming from, and whom you serve.”<sup>78</sup> Essentially, the project vision and master plan is essential to the creation of a discovery room; it is what holds the project together.

Finally, my interview with Judith White (Marcellini), the founder of the first discovery rooms at the Smithsonian’s NMNH, about her opinion of the

current state of discovery rooms was especially revealing and is worth noting. I was interested in hearing if she felt that interactive exhibition spaces are staying true to the original intent of the discovery room and also what characteristics define successful discovery rooms today. Upon reflecting on current discovery rooms, White (Marcellini) felt that they had lost focus of the original intent. Moreover, she revealed that she has not seen a stellar example of a discovery room in quite a few years. “The new ones didn’t get it right and the old ones...well, entropy sets in.” She continued to explain that with staff changes, the new staff is not informed of the original thinking or vision of the project; this causes the discovery room to be “somewhat degraded or changed from what it was originally meant to be.” In fact, last year White (Marcellini) visited the *Discovery Room* she had created at NMNH thirty years prior and was shocked at the commercialism of the space. It had “turned into something horrid, [like] a merchandise display at J.C. Penny’s.”<sup>79</sup>

White (Marcellini)’s experience exposes a potential disconnect between theory and modern-day practice. While discovery rooms can be visited in many museums, the standards and methods vary, resulting in uneven quality. The potential for discovery rooms to meet the needs of family visitors is evident and there is clearly a trend to create these spaces in traditional museums. Yet, standards vary widely, resulting in uneven experiences and quality of engagement.

## Conclusions

The research for this project confirmed that discovery rooms are a growing trend among museums that wish to add interactivity as an exhibition technique. An increasing number of museums currently have or are planning to create a discovery room or another form of interactivity. Over half of the museums I surveyed had an interactive exhibition space, most of which opened after 1990. More than a quarter of respondents are planning to open a discovery room in the near future, including museums that are adding an additional interactive space. Museum professionals clearly recognize the rising popularity of discovery rooms. When surveyed about what influenced the development of his discovery room, one museum educator replied, “a general sense that it was time to change.”

I got the impression from museum educators that having an interactive exhibition space was a source of pride, as if it were a validation of a progressive and family-friendly institution. For example, the Executive Director of a history museum in Southern California stated that the idea to create a discovery room was highly desirable: “Interactive exhibits are clearly an area that I would like to develop.” A further manifestation of this trend is the presence of professional development sessions and workshops that focus on creating interactive exhibition spaces for the family audience. One such symposium was the Getty Museum’s *From Content to Play: Family-Oriented Interactive Spaces in Art and History*

*Museums*. Over 160 attendees from museums around the United States attended this symposium in Los Angeles, CA in June 2005.

Despite this popularity, however, at the core of my findings is the lack of a concrete vision, project goals and educational objectives for the discovery rooms. This lack of clarity exacerbates communication problems and creates confusion among museum educators, outside exhibit designers and developers, marketers and ultimately visitors. Museum educators listed their biggest challenges in designing a discovery room as money, space, time and maintenance – standard issues within a nonprofit museum. Interestingly however, when exhibit designers were asked the same question, they identified a more systemic challenge. Nearly one third cited their lack of definition as a chief challenge. They reported that they felt that museum professionals did not: 1) define project goals and or understand the museum’s educational philosophy, 2) define leadership, such as a decision making process of how to review work, and 3) understand their audience in terms of who they are trying to reach and what they expect visitors to do within the space. Therefore, the project identified that museum educators need to be more purposeful and clear in the design of a discovery room.

Educators may embrace the idea of interactive exhibition spaces yet according to my research, many lack a solid foundation of the philosophy and reasoning behind creating the space. Moreover, roughly ten percent of survey respondents could not recall the educational theories that influenced the

development of the discovery room. One museum educator replied, “I was hired one month before the gallery space opened.” This newly hired educator was responsible for an interactive exhibition space without knowledge of the original intent or educational goals. Exhibit designers repeatedly mentioned that museums could not clearly express the reasons for creating a discovery space. Without a solid understanding of the purpose of the space, the vision and overall concept for the discovery room are vague and ambiguous. Director of Interactive Design at ESI Design Frank Migliorelli stated, “museums have not clearly thought it all out. They are not sure what they really want.”<sup>80</sup> Thus, the issue at hand is not the standard challenge of budget, time and resources, it goes much deeper.

Consequently, the lack of a project vision compromises the quality of a discovery room. This is demonstrated by the various ways museums have defined, interpreted and replicated discovery rooms. It appears that museum educators and outside exhibit designers and developers have their own individual definition and understanding of the term “interactive.” Exhibit designer Sara Smith noticed this discrepancy and stated, “Every client says they want interactives or interactivity and they [each] mean it differently.”<sup>81</sup> Without a clear understanding of what it means to be “interactive,” the goal and vision of the discovery room, and ultimately the quality of the visitor experience suffer. This problem manifests itself in two ways: 1) museum educators are reluctant to admit they do not a discovery room and therefore rely on a loose definition of “interactivity” or 2)

museum educators do not understand what it means to be an interactive space and therefore think they are providing interactive experiences for visitors when they are not. When asked if their museum has a discovery room, a few museum educators offered information about other forms of interactives their institution provided. One Executive Director considered a train ride and demonstration railway as a family-friendly interactive. Our museum, he stated, “[offers] a 10-mile round trip train ride on authentic, restored historic trains.” Train rides, along with flip top labels or push button exhibits, are fairly passive and not a true interactive in terms of supporting learning theory. Peter Exley of architectureisfun, Inc. reflected on museums’ common misconception, “push a little red button...oftentimes that’s the extent of the interactive and there is a short essay right next to it.”<sup>82</sup>

Likewise, in an effort to join the movement towards interactivity yet without having a clear vision or understanding of interactive spaces, museum staff misconstrue the meaning of a discovery room. Without agreement of the intention of the space, it is a misuse of limited resources. Several exhibit designers mentioned that museums tend to ask for interactive components for “interactivity’s sake.” When this occurs, museums are missing an opportunity to better serve their audience – especially families; meet their mission and provide meaningful interpretation of their collection. Upon being questioned about the role of collections in the discovery room, one Education Program Manager

replied, “I am trying to make connections to our collection through puzzles which are images of objects on display and a DVD that flashes part of our collection onto a screen.” In other words, there is no strong correlation between this museum’s collection and discovery room components. When one museum professional visits a discovery room and sees a map or a photo cut up into puzzle components, she asks “what does [this] have to do with learning environments?” She wishes that discovery rooms would incorporate “less gratuitous kinesthetic activity.”<sup>83</sup> Although interactive exhibition spaces are ideal for providing family audiences with discovery- and inquiry-based learning experiences, museums are falling short of this goal when there is no intentionality in the exhibits and activities offered. It is a superfluous use of precious resources to create an interactive exhibition space without a solid vision of the project.

Another misunderstanding of the intent of discovery rooms is when a space loosely resembles the original discovery room created in the 1970’s, the National Museum of Natural History (NMNH). When I visited the *Discovery Center* at the Natural History Museum of Los Angeles County (NHMLAC), I felt that I was stepping back into the 1970’s. From the posters on the wall to the carpet on the floor to the design and layout of the furniture, the look and feel of the NMNH’s 1974 *Discovery Room* had been faithfully reproduced. As museum consultant Janet Kamien noted, “if it has carpet risers for the children to plop down,” then some museums feel they created a successful discovery room.<sup>84</sup>

Reflecting upon the current state of discovery rooms, Judith White (Marcellini), who co-created NMNH's discovery room, mentioned that these spaces "become cliché; [museums] copy something because that is how someone else did it... but [do not] copy the philosophy behind it."<sup>85</sup> Because museums are unique in terms of audience, mission and collection, resembling another institution's discovery room compromises the visitor experience by not addressing the museum's particular collection, educational philosophy and community.

Without an understanding of the reasoning behind creating an interactive space and without a vision for the project, it is nearly impossible to define project goals. Without project goals or an overall vision of the discovery room, there is no framework to guide the design process or evaluate outcomes. Oftentimes in planning a discovery room, the museum's project team neglects to create a solid interpretation plan and instead proceed with brainstorming the exhibit components without a vision of the overall product. The President of one private firm remarked that museums "have activities outlined but not the mission, visitor goals and objectives, concept narrative or visitor experience."<sup>86</sup> Therefore, some educators plan activities without reflecting upon the museum and their audience, let alone creating a narrative and interpretation plan. It is okay for museums to approach outside design firms without a clear understanding of their project goals, explained exhibit developer Sari Boren, if the museum staff is aware of this and can willingly admit it. There is no need for the museum's project team to get

defensive or hide the fact they lack project goals. If the museum staff can identify that they lack project goals and can reveal this fact to the design firm, she said, the firm can help the museum create them.<sup>87</sup>

The lack of project goals is reflected in the museum's marketing campaigns and promotional materials for the discovery room. Without identifying the target audience or the intended visitor experience, marketers are unclear as how to promote the space. Marketing literature and advertisements about discovery rooms generally use text and graphics that perpetuate the idea that these spaces are only for children or are for families with *young* children. This type of marketing neglects families with older children, such as tweens and teens who do not consider themselves children. Most likely, parents interpret such marketing as promoting a learning environment solely for their child as opposed to one for intergenerational learning, where *they* could learn alongside the children. Independent Museum Consultant Janet Kamien remarked that museums "forget to make [these spaces] adult-friendly."<sup>88</sup>

In addition to project goals, it was evident that more attention needs to be paid to the interpretive and educational goals of discovery rooms. Discovery rooms are ideal spaces for constructivist and discovery learning yet it seems that education is not always one of project team's top priority. Although only about ten percent of museum educators could not clearly identify the educational goals for their discovery room, one third of outside exhibit designers identified this as a

major challenge when working with museums. Upon being questioned about the educational goals for the discovery room, one museum educator responded “[to] make people curious,” while another educator listed “touching, exploration, using all senses.” With such vague goals, there is no method to identify or evaluate the visitor learning. Exhibit designer Addy Froehlich suggested that museums establish goals for an exhibit; they should know “what ideas they want to get across and the take away message.”<sup>89</sup> Educators have not clearly outlined learning outcomes – what they want the visitor to understand or demonstrate. In order to evaluate the achievement of educational objectives, the project team needs to identify the main message and learning outcome.

By not identifying a vision, project goals or educational outcomes for a discovery room, even well-established and prominent museums may be missing an opportunity – or worse, mis-serving visitors. Museum educators identified that they are spending valuable resources to create and operate a discovery room. Yet, without clear goals and objectives these efforts may be misguided. My research, for example, uncovered one institution that spent a significant amount of money on the “sophisticated design” of the discovery room. Yet, anecdotal research showed that visitors were misinterpreting some of the activities and exhibits. One activity was ignored because visitors thought it was a design feature. In another exhibit, visitors were writing on the wall and completely ignoring the intended activity. A space intended for quiet activity was too noisy and hectic. Perhaps

most significant, the restrooms were located in an entirely different building and very difficult to find. If visitors wanted to return to the interactive space after going to the restroom, they would have to wait in line again to enter. This example highlights the need for proper planning when developing an interactive exhibition space in a traditional museum.

## **Recommendations**

Museums should focus and invest in the design and programming of their interactive exhibition space to create a better experience for their family visitors. Three consistent problems revealed by all parties in my research are museums' lack of clarity, disorganization and indecisiveness around the creation of discovery rooms. In order to alleviate these challenges, museums need to reevaluate why they have a discovery room and how the space addresses the needs and abilities of their intergenerational audience. Informed by the results of my research, I propose the following recommendations for museum educators and in-house exhibit developers.

### **1. Reflect upon your unique mission, collection and community**

The creation of a discovery room should grow organically out of the museum's mission, collection and community. However, my research found the tendency for museum professionals to begin creating a discovery room by first outlining activities or an overall concept for the space. By jumping ahead, museums miss one very important step – ensuring that the discovery room connects to the museum's core assets. The space should be a natural extension of the museum's traditional galleries and therefore guided by similar principles. To articulate a vision and identify priorities of an interactive space, it is necessary to understand the mission statement. The mission generally describes and defines

who you are, who you serve, what you do and why you exist. Additionally, the collection of the museum determines the objects or concepts that can be interpreted and examined in the space. Lastly, as a public institution, museums should foster relationships with the community – understand their needs and how to serve them.

## **2. Articulate a vision for the project.**

The vision of the discovery room should be defined in regards to your museum's core assets, as mentioned above. Because the vision is a detailed picture of what you want to achieve, it forms the foundational basis upon which to create project goals and learning outcomes. It focuses and shapes the project by providing a conceptual framework for the discovery room. Moreover, it builds criteria on which to determine if the discovery room is successful.

## **3. Develop project goals and a plan of action.**

Use your museum's core assets and project vision to clearly define your project goals. Goals should describe what you expect to achieve and answer the following questions: why, for whom and how are we creating this space? By identifying project goals, you are establishing priorities, developing criteria for evaluation and defining the expected visitor experience. A concrete plan of action manages goals and devises a method to complete the project. A plan identifies the

project team, timeline and budget as well as the steps involved in carrying out the project goals. By deciding on project goals and an action plan, you are setting your priorities, developing criteria for evaluation and defining the expected visitor experience.

#### **4. Define educational goals and learning outcomes.**

Determine educational goals and learning objectives for the discovery room. *Educational goals* are what you want the visitor to learn or understand and *learning outcomes* are indications of what the visitor was able to do or understand. Not only should the project team define expectations of what visitors of all ages will do in the space, but also to establish criteria of learning on which to evaluate the space. It is important to be able to review and evaluate that the interactive exhibition space is a successful learning environment.

#### **5. Create a family-friendly museum.**

Integrate the value of intergenerational learning through the museum. Discovery rooms are not an excuse to separate family visitors from the rest of the galleries and therefore should not be the sole experience of a family's entire visit. Well-designed and programmed interactive exhibition spaces are just the first step to creating a welcoming environment that addresses the needs and abilities of an intergenerational audience. The museum's offerings and amenities ought to

take the family visitor into consideration. Family-friendly amenities include restrooms with changing tables, stroller parking, and ample seating areas. Exhibit developer Sari Boren urges museum educators to embrace intergenerational visitors throughout the exhibit halls: “so much learning is involved in conversations [such that] having noisy and chaotic galleries is not necessarily a bad thing.”<sup>90</sup>

## **6. Become an advocate for change.**

Do not be alarmed if some staff in your institution are resistant to change and especially to serving families. Educators and exhibit designers must continue to push these ideas of interactivity and multigenerational learning in order to transform the current state of exhibit design. In the late 1980’s, Michael Spock became the Vice President for Public Programs at the Field Museum of Natural History (Field Museum). As the former Director of the Boston Children’s Museum for twenty-three years prior, Spock had experience in transforming the interpretation of collections. His plans to change the Field Museum’s exhibit halls to become more interactive caused quite a stir with curators. When someone approached Spock alerting him that the staff was afraid he would turn the Field Museum into Disneyland, he replied “oh no, that’s far too passive.”<sup>91</sup>

## Endnotes

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- <sup>1</sup> Donald Sibbett, telephone interview, 2 March 2006.
- <sup>2</sup> "Understanding the Theory of Multiple Intelligences," *Scholastic Early Childhood Today* Nov./Dec. 2005:13-14.
- <sup>3</sup> Judith White (Marcellini) was a museum educator for the Smithsonian for about 25 years, including the National Museum of Natural History, the National Zoo and the National Science Resources Center.
- <sup>4</sup> Mary Alexander is currently the Director, Museum Advancement Program for the Maryland Historical Trust.
- <sup>5</sup> For further information, please refer to: Alex Hamilton, "Children's Museums, Computer Technology and Developmentally Appropriate Practice," thesis, John F. Kennedy U, 2005, [http://watson.jfku.edu/Museum\\_Studies/Childrens\\_Museums.pdf](http://watson.jfku.edu/Museum_Studies/Childrens_Museums.pdf).
- <sup>6</sup> John Dewey, *Experience and Education: The 60<sup>th</sup> Anniversary Edition* (West Lafayette, Indiana: Kappa Delta Pi, 1998) 13.
- <sup>7</sup> Dewey 42.
- <sup>8</sup> George Hein, "John Dewey and Museum Education," *Curator* 47/4 (2004): 423.
- <sup>9</sup> Hein, "John Dewey" 414-24.
- <sup>10</sup> Ted Ansbacher, "John Dewey's Experience and Education: Lessons for Museums," *Curator* 41/1 (1998) 39.
- <sup>11</sup> Ansbacher 38.
- <sup>12</sup> Howard Gardner, *Intelligence Reframed: Multiple Intelligences for the 21<sup>st</sup> Century* (New York: BasicBooks, 1999) 28-34.
- <sup>13</sup> Gardner, *Intelligence* 41-43.
- <sup>14</sup> Howard Gardner, *Frames of Mind: The Theory of Multiple Intelligences* (New York: BasicBooks, 1985) 8-9.
- <sup>15</sup> Gardner, *Intelligence* 185-87.
- <sup>16</sup> Gardner, *Intelligence* 169-90.
- <sup>17</sup> Mihály Csikszentmihályi and Kim Hermanson, "Intrinsic Motivation in Museums: What Makes Visitors Want to Learn?" *Museum News* May/June (1995) 36.
- <sup>18</sup> Csikszentmihályi and Hermanson 36.
- <sup>19</sup> George Hein, *Learning in the Museum* (New York: Routledge, 2004) 34.
- <sup>20</sup> Hein, *Learning* 35.
- <sup>21</sup> Kodi Jeffery-Clay, "Constructivism in Museums: How Museums Create Meaningful Learning Environments," *Journal of Museum Education* 23/1 (1998) np.
- <sup>22</sup> Jeffery-Clay, np.
- <sup>23</sup> Jeffery-Clay, np.
- <sup>24</sup> Jonathan Osborne, "Constructivism in Museums: A Response," *Journal of Museum Education* 23/1 (1998), np.
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- <sup>26</sup> Vygotsky, Lev, *Mind in Society: The Development of Higher Psychological Processes* (Cambridge: Harvard UP, 1979) 86.
- <sup>27</sup> Vygotsky 90.
- <sup>28</sup> Marcia Brumit Kropf and Inez Wolins, "How Families Learn: Considerations for Program Development," *Marriage and Family Review*, 13/4 (1989): 82-83.
- <sup>29</sup> Brumit Kropf and Wolins, "How Families Learn" 82.
- <sup>30</sup> Marcia Brumit Kropf, "The Family Museum Experience: A Review of the Literature," *Journal of Museum Education*, 14/2 (1989) 225.

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- <sup>31</sup> Lynn Dierking, "The Family Museum Experience: Implications from Research," *Journal of Museum Education*, 14/2 (1989) 218-219.
- Dierking's observations are also supported by a seminal study by Marilyn Hood. Hood stresses in "Leisure Criteria of Family Participation and Nonparticipation in Museums" that families must feel welcome, comfortable and rewarded for their leisure experience. She states that in order to convert families into frequent visitors, museums must offer "more social interaction and active participation opportunities."
- <sup>32</sup> Minda Borun, J. Dritsas, J. Johnson, N. Peter, K. Wagner, K. Fadigan, A. Jangaard, E. Stroup and A. Wegner, *Family Learning in Museums: The PISEC Perspective*, (Philadelphia: Franklin Institute, 1998) 23.
- <sup>33</sup> Borun, Dritsas, Johnson, Peter, Wagner, Fadigan, Jangaard, Stroup and Wegner, *PISEC* 23.
- <sup>34</sup> Doris Ash "How Families Use Questions at Dioramas: Ideas for Exhibit Design," *Curator* 47 (1) (2004): np.
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- <sup>37</sup> Lynn Dierking, Jessica Luke, Kathryn Foat and Leslie Adelman, "The Family & Free-Choice Learning," *Museum News* November/December (2001): 41.
- <sup>38</sup> Minda Borun, Margaret Chambers, Jennifer Dritsas and Julie Johnson, "Enhancing Family Learning Through Exhibits," *Curator* 40 (1997): np.
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- <sup>41</sup> Ann Baillie, "Empowering the Visitor: The Family Experience of Museums a pilot study of ten family group visits to The Queensland Museum," Here Today Done Tomorrow: Developing New Audiences, paper presented at the Museums Australia Conference, Sydney 30 October 1996, 11.
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- <sup>43</sup> Borun and Dritsas, "Family-Friendly Exhibits" np.
- <sup>44</sup> Marianna Adams and Jessica Luke, "From Heart to Head to Hand: A Synthesis of Issues & Strategies Raised at the *From Content to Play* Symposium," presented at the J. Paul Getty Museum Symposium, *From Content to Play: Family-Oriented Interactive Spaces in Art and History Museums*, June 4-5, 2005: np.
- <sup>45</sup> Judith White and Susan Nichols, *Snakes, Snails and History Tales* (Washington DC: Smithsonian Institution, 1991) 1.
- <sup>46</sup> Joan Madden, "The Discovery Room: A Place for Learning," *Children Today* September/October (1982): 10.
- <sup>47</sup> Judith White and Sharon Barry, *Families, Frogs and Fun: Developing a Family Learning Lab in a Zoo and HERPlab: A Case Study*. (Washington, DC: Smithsonian Institution, 1984) 16.
- <sup>48</sup> Malcolm Arth and Linda Claremon, "The Discovery Room," *Curator* 20/3 (1977): 179.
- <sup>49</sup> Wendy Pollock, "Discovery Rooms: An Alternative Experience of the Museum," *ASTC Dimensions* November/December (1999): np.
- <sup>50</sup> Judy Diamond, Anita Smith and Alan Bond, "California Academy of Sciences Discovery Room," *Curator* 31/3 (1988): 159.
- <sup>51</sup> Ruth Freeman, *The Discovery Gallery: Discovery Learning in the Museum*. (Ontario: Royal Ontario Museum, 1989) 50.
- <sup>52</sup> Adams and Luke, "Heart to Head to Hand" 2.

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- <sup>53</sup> Marianna Adams, Cynthia Moreno, Molly Polk and Lisa Buck, "The Dilemma of Interactive Art Museum Spaces," *Art Education* (2003): 42-52.
- <sup>54</sup> Excellence and Equity: Education and the Public Dimension of Museums, ed. Ellen Hursey, (Washington D.C.: American Association of Museums, 1992).
- <sup>55</sup> Sibbett, interview.
- <sup>56</sup> Caryl Marsh, telephone interview, 8 April 2006.
- <sup>57</sup> Judith White (Marcellini), email correspondence, 27 March 2006.
- <sup>58</sup> Amelia Chapman, Director of Education, San Diego Air and Space Museum, written survey response Feb. 16, 2006.
- <sup>59</sup> Diadre Metzler, Fresno Metropolitan Museum, written survey response Feb. 23, 2006.
- <sup>60</sup> Anonymous, personal interview 8 June 2006.
- <sup>61</sup> Sari Boren, telephone interview, 4 May 2006.
- <sup>62</sup> Diadre Metzler, email correspondence, 26 May 2006.
- <sup>63</sup> Abby Klinger, telephone interview, 16 March 2006.
- <sup>64</sup> Caryl Marsh, telephone interview, 8 April 2006.
- <sup>65</sup> Vas Prabhu, telephone interview, 4 November 2005.
- <sup>66</sup> Addy Froehlich, telephone interview, 27 March 2006.
- <sup>67</sup> Klinger, email correspondence.
- <sup>68</sup> Prabhu, interview.
- <sup>69</sup> Klinger, interview.
- <sup>70</sup> Klinger, interview and email correspondence.
- <sup>71</sup> Peggy Fogelman, Assistant Director for Education and Interpretive Programs, The J. Paul Getty Museum, survey response, March 3, 2006.
- <sup>72</sup> Addy Froehlich, telephone interview, 28 March 2006.
- <sup>73</sup> Sara Smith, telephone interview, 27 March 2006.
- <sup>74</sup> Peter Exley, telephone interview, 4 April 2006.
- <sup>75</sup> Klinger, interview and email correspondence, 20 June 2006.
- <sup>76</sup> Froehlich, interview.
- <sup>77</sup> Anonymous, telephone interview, 5 April 2006.
- <sup>78</sup> Frank Migliorelli, telephone interview, 17 March 2006.
- <sup>79</sup> Judith White (Marcellini), telephone interview, 12 February 2006 and email correspondence, 4 July 2006.
- <sup>80</sup> Migliorelli, interview.
- <sup>81</sup> Sara Smith, interview.
- <sup>82</sup> Exley, interview.
- <sup>83</sup> Anonymous, telephone interview, 4 April 2006.
- <sup>84</sup> Janet Kamien, telephone interview 4 May 2006.
- <sup>85</sup> White (Marcellini), interview.
- <sup>86</sup> Anonymous, telephone interview, 5 April 2006.
- <sup>87</sup> Boren, interview.
- <sup>88</sup> Kamien, interview.
- <sup>89</sup> Froehlich, interview.
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## **Appendix A**

### **Exhibit Designer Interview Questions**

1. How do you define “hands-on?” How do you define “interactive?”
2. What are some projects you’ve worked on that targeted families?
3. How do you design specifically for families? (in terms of aesthetics, text etc)
4. What role does the museum’s collection play in the interactives?
5. What educational theories or resources, if any, guide you?
6. What inspires you and sparks your creativity?
7. Which museum staff members do you want on the project team?
8. When given a limited budget, what type of prototyping/evaluation would you suggest?
9. What were some of your biggest challenges or difficulties when working with museums?
10. What were some of your biggest challenges or difficulties when working with interactives?
11. What do you wish museums would know or do to make your job easier?
12. How do you personally define success?
13. What advice would you give somebody who was contemplating creating an interactive space for families?

14. Do you know of any other interactive spaces that you would consider good examples in the field?
15. Is there anything else you'd like to tell me about discovery rooms and interactive spaces?
16. Is there anyone else you think I should speak with?

## Appendix B

### Museum Educator Survey

Does your museum have an interactive exhibition space?

Yes

No

If not, are you contemplating or planning to develop one?

Yes

No

Unsure

What is the focus of your primary collection?

We do not have a collection

Anthropology

Art or Art history

History or historical site

Living collection: zoo, aquarium, garden

Natural history

Science

Other

What do you call your interactive exhibition space?

Children's gallery / Children's room

Discovery room / Discovery space

Drop-in art studio

Exploration center

Family gallery / Family room

Interactive gallery

Other

Approximately how many sq. ft. of exhibition space does your museum have?

Approximately how many sq. ft. of *interactive* exhibition space does your museum have?

In what year did your interactive exhibition space open?

When, if ever, has your interactive exhibition space been upgraded or changed?

Who is the intended *primary* audience for your interactive exhibition space?

- Adults
- Children
- Families
- General visitors
- School groups
- Other

Which staff members participated on the team to create the interactive exhibition space?

- Collections managers
- Curators
- Education dept.
- In-house exhibition developers
- Outside design firm
- Other: Who designed the interactive exhibition space?
- In-house designers
- Outside design firm
- Both in-house and outside designers
- Other

What types of interactives do you have in this interactive exhibition space?

Is the room staffed?

- Yes
- No

If yes, by whom and how many hours/week?

Do exhibits or components of your interactive exhibition space change?

- Yes
- No

If yes, which ones and how often?

Have you evaluated your interactive exhibition space?

- Yes
- No

If yes, what type(s) of evaluation did you perform?

Do you have takeaways? If so, what?

Which educational theories, if any, influenced the development of your interactive exhibition space?

What were your educational goals in the design of your interactive exhibition space?

What is the role of collections in your interactive exhibition space?

What worked well in the design of your interactive exhibition space?

What were the challenges, if any, in the design of your interactive exhibition space?

Has the opening of your interactive exhibition space altered visitor demographics?

Yes

No

Unsure

If yes, how?

Are there interactive exhibition spaces in other museums that have inspired you?

If yes, which?

## Appendix C

### Museum Educator Survey Results

Does your museum have an interactive exhibition space?

Yes	21	55%
No	17	45%

If not, are you contemplating or planning to develop one?

Yes	7
No	6
Not Sure	8

What is the focus of your primary collection?

We do not have a collection	2
Anthropology	2
Art or Art history	8
History or Historical Site	3
Living collection: zoo, aquarium, garden	
Natural History	4
Science	1
Other	
Other: Maritime history	
Other: Musical instruments & products	
Other: Trains	
Other: Classic cars	
Other: Photographic art	

Additional Comments:

- 1) Zoo, 2) natural history 3) garden 4) science 5) art
- Anthropology, art, history/historical site, natural history, science
- Art, history and natural sciences
- Art, history or historical site
- Art, history or historical site
- Art, local history (or historical site)
- Art, science

- Living collection, natural history
- Natural History, Anthropology, History or Historical Site
- Outdoors! History, other: aircraft museum
- We do not have a collection. Other: craft, folk art
- We do not have a collection. Science

What do you call your interactive exhibition space?

Children's gallery / Children's room	3	14%
Discovery room / Discovery space	4	18%
Drop-in art studio		
Exploration center		
Family gallery / Family room	2	9%
Interactive gallery	2	9%
Other		

Other: [blank]

Other: Activity Center

Other: Biology Lab

Other: Exhibit hall & Discovery Den & Learning Lab

Other: Hands-on the Future (interactive music-making room)

Other: many exhibits are interactive

Other: name of exhibit usually. I call it the Interactive Gallery, many still call it the Children's Play Area, unfortunately.

Other: the museum

Other: train ride/demonstration railway

Other: Zone 101

Additional Comments:

- 1) Other: Reeves Ask Science Center, (2) we often add interactive stations to other exhibits
  - Children's Discovery Center
  - Discovery center & discovery carts
  - Discovery room (for art gallery reinstallation plan)
  - Family gallery (permanent) & interactive gallery (temporary)
  - Interactive gallery, other: our new permanent exhibition has interactive embedded with it
- There are interactive exhibits in 3 of our displays, more to come

Approximately how many sq. ft. of exhibition space does your museum have?

- Variable
- Changes, so I don't know. We are on ships.
- 3.3 acres
- 1,000
- 2,250
- 3,000
- 3,500
- 4,100
- 6,000
- 6,500
- 2,500 temporary, 8,000 permanent
- 12,000
- 20,000
- 25,590
- 30,000
- 45,000
- 127,000
- 240,000

Approximately how many sq. ft. of *interactive* exhibition space does your museum have?

- Varies, 1,000+
- Changes so I don't know, we are on ships.
- 0-20
- 0
- 10-mile round trip
- 15 if needed
- 40
- 300
- 400
- 600
- 800
- 1,000
- 1000
- 2,500
- 2,500
- 8,000

756 for Family Room, 7500 for other permanent, adult interactive spaces,  
800 for interactive technology space and variable within special  
exhibitions  
10,000  
10,000

In what year did your interactive exhibition space open?

1959  
1975 (approx)  
1982  
1986  
1987  
1989  
1993  
1997  
1997  
1999  
2000  
2000/2007  
2002  
2005  
2005-2006  
April 2005  
Future  
Museum opened in 1962.  
On and off for years  
Planned for 2009  
Unsure  
When the museum opened in 1984

When, if ever, has your interactive exhibition space been upgraded or changed?

1993  
2001  
2004  
2004  
2005  
2006  
Annually (science) regularly (exhibits)  
Every year

Evolving  
Expanded in 1992 and major expansion planned for 2007  
For 2006  
It is new  
It's being done now  
New installation annually  
Ongoing  
Ongoing  
Renovation in 2001/2002  
Yes  
Yes

Additional Comments:

- The Discovery Center has experienced upgrades to its exhibitions off and on over the years. Since its founding, the living collections area has been refurbished at least 10 times. This includes the introduction of new animals (i.e. reticulated pythons, boa constrictors, various amphibians, and rabbits) to the subsequent refurbishment of their habitat cages and tanks. By comparison, the other aspects of the Discover Center have received less attention and upgrades. For example, the dinosaur dig pit, which was part of the original 1986 installation of the D.C., was upgraded following our Tiniest Giants exhibit from the early 2000's. In addition to adding a second dinosaur cast to be excavated, we also exchanged the digging matrix of sand (quite messy) with diced rubber tires. It proved to be easier to clean and less dangerous (i.e. sand in children's eyes) than the sand. I also know that the original Discovery Center once had an area for children to try on and wear clothing from Colonial America and Mission-Period California. This section was removed sometime in the mid-1990's and changed into administrative and storage space. As an aside, I have recently obtained photographic evidence showing that the living collections have appropriated more and more square footage inside the Discovery Center over the years. According to the photos, in 1986 living collections represented less than 10% of the floor space in the D.C. Now in 2006 they occupy double that amount. Roughly 10 years ago a new animal care technician arrived to the D.C. and discovered the needs of the animals were not being met and took the necessary steps to address the situation. Consequently, the living collections began to take more and more physical space.

Who is the intended *primary* audience for your interactive exhibition space?

Adults		
Children	3	13%
Families	8	33%
General visitors	6	25%
School groups		
Other		
Other: Adults, children, general visitors, school groups		
Other: All for science		
Other: Children, families, general visitors, school, different audiences depending on exhibit		
Other: Children, families, school groups		
Other: Families & school groups		
Other: Families, general visitors, school groups		
Other: Families, school groups -- pretty balanced between these groups		

Additional Comments:

- Families - there are other adult oriented interactive spaces
- Identifying the primary audience is difficult to ascertain. M-F our audience is scheduled school groups (pre-K – 3rd graders predominate). But in the afternoon families usually show up (just mothers and their 3-7yrs old kids). A shortcoming I have found with the D.C. is that we do not know who our primary audience is anymore. The literature indicates the D.C. was founded first-and-foremost to address the needs of handicapped individuals. D.C. architects believed this audience group could be better serviced with a tactile museum experience since the traditional museum ritual of movement + observation = appreciation/reverence may be too physically challenging. After that it mentions servicing the needs of school children and families.

Which staff members participated on the team to create the interactive exhibition space?

Collections managers	3
Curators	10
Education dept.	12
In-house exhibition developers	14
Outside design firm	8

Other

Other: Architecture Consultants  
Other: Child Development Specialist  
Other: Consultants from Cal State LA's Education Department  
Other: In-house graphic designers  
Other: Maintenance department  
Other: Museum Director  
Other: Science Department  
Other: Staff  
Other: University design professor

Who designed the interactive exhibition space?

In-house designers	7
Outside design firm	1
Both in-house and outside designers	6
Other	2
Other: Staff	
Other: Education Department	

What types of interactives do you have in this interactive exhibition space?

- A 10-mile round trip train ride on authentic, restored historic trains
- Art materials to touch, video showing artist at work next to artwork by that artist, hearing diff interpretations about an artwork on view, then visitors leave their own, drawing activity
- Art-making, collaborative play, kinesthetics, reading activities, hands-on manipulation, seek and find, 3-D building/construction
- Depends on exhibit - but mostly, children's hands-on activities
- Dinosaur Dig Pit; Southern California Native American Daily Life (Mano, Metate, Mortar, Pestle, Acorns, & Pine Nuts) and Fossil Rubbing
- Egyptian market, dress the royal cat, throne, senet game, boat on the Nile. Hands-on, low-tech, dress-up, role-playing interactive
- Electronic games, mechanical exhibits, a/v loops initiated by button, discovery desk, etc
- Exhibition: information work stations; education: information computer - upcoming: audio devices for exhibition viewing
- Exhibits from the Exploratorium (san Francisco) primarily
- Future
- Instruments - acoustic and electronic (v-drums, Yamaha, Clarinova, Theremin, organ, guitars, percussion...)

- It varies... we do not have a permanent collection. We do changing exhibitions with guest curators, so depending on the exhibition; we may or may not have an interactive space.
- Kinesthetic (ergonomics) extinction panel, plate tectonics, cell discovery, and more as new temporary exhibits include interactives
- Making your own flag with magnets, operating model rain, making nautical knots with rope
- Patrons push buttons to start audio/visual presentations. Drink tea from a samovar. Look in microscopes and viewing devices. Lots of 3-d/anaglyph presentations. Small exhibit
- Puzzles, building blocks, chalk board, "rabbit hole" where families can look into the sculpture garden
- Puzzles, hidden animal search, hands on manipulatives
- Puzzles, mazes, computer programs
- Rubbing tables, petting pool, push button sound boards, new IAVK's being designed
- See enclosed brochure [note: not enclosed]
- Studio art activities, including drawing painting collage and assemblage. Manipulatives, computer based, writing, books
- Varies: airplanes to sit in, interactive wind tunnels, slice of 737 fuselage, toddler toy corner, books, pretend air traffic tower, air experiments
- Video, Audio - interviews; scripted dialogue, hands on replicas, primary resources (photos, personal items)
- We have one space called "the Chumash Discovery Center" this is open on school tours and family days. It has stations to try traditional Native American skills/crafts (acorn grinding, pigment mixing, snakeskin sanding, shell bead making).

Is the room staffed?

Yes	12	75%
No	4	25%

If yes, by whom and how many hours/week?

- 1-2 docents, 5 days a week
- About 15 hrs/wk
- By volunteer docents during all open hours
- College students 40 hrs/week
- Depends on exhibition, about 3 hours/day

- Docents/volunteers. 49hrs/week
- Gallery Interpreters (Museum Educators) staff the Discovery Center Monday thru Sunday full – time (10am – 4:45pm).
- Hired staff are present during all open hours
- Not during a specific exhibition or installation
- Open public hours = 21 hrs/week & when field trips are scheduled.
- Part time staff and volunteers, all public hours
- Security guard
- Staff & volunteers. There is always someone present for support.
- The Discovery Center is staffed by volunteers. Volunteers - the exhibit interactives are not staffed.
- The Family Discovery Gallery is staffed 50 hrs/wk by museum staff. The interactive section of the fur trade is staffed about 35 hr/wk
- Volunteer interpreters about 20 hrs/week  
Youth volunteer. 3hrs/wk

Do exhibits or components of your interactive exhibition space change?

No	4	29%
Yes	10	71%

If yes, which ones and how often?

- All variable lengths: "you're in the pilot's seat" 1 yr, "beyond the Pilot's Seat - 2yrs, "Space Adventures (rental) 3 months, AirPlay (rental) 3 months
- Every 4 months
- Every 6 months or so
- Every year we add at least one new component
- Everything, 4 times per year
- Exhibitions change every 3 months (approximately)
- In changing exhibit we incorporate an interactive space. It of course varies with each exhibit. For example, in our last art exhibit we had a space to create your own still life setting and sketch it with colored pencils
- Nearly all of the science exhibits change annually; a few of the most popular remain on exhibit
- Not during a specific exhibition or installation
- Planned for every 6-12 months
- Seasonal exhibits at back desk area
- Some exhibitions have no interactive component

- The exhibit space is throughout the campus
- The Family Discovery Gallery every 7-8 years
- The ones that are brought in from other companies - 3x/year
- They change per exhibit
- They will, seasonally
- Traveling exhibits rotate in/out about 3-6 months  
We use 2 diff trains on diff days

Have you evaluated your interactive exhibition space?

Yes	12	80%
No	3	20%

If yes, what type(s) of evaluation did you perform?

- (1) On the job: many technical problems. (2) Visitor comments
- A summative evaluation study conducted by Randi Korn and Associates
- Audience evaluation - we had them rate the activities in prototype
- Basic surveys for demographic info
- Hired evaluation company
- Informal - verbal and guest book comment section
- Plan to evaluate prototypes
- Summative using written surveys and interviews
- Tracking
- User survey. And visual observation
- Visitor observation, amount of time spent (compared to other museum galleries), visitor feedback forms - what did they think?
- Visitor surveys
- We did evaluate the previous space in 1999, prior to reinstalling the current
- Written surveys and informal chats w/ customers
- Yes - The Discovery Center is evaluated by teachers. No - only observation

Do you have takeaways? If so, what?

- "Trading" cards
- Brochures, children's discovery map
- Exhibit guide
- Family guides from exhibit, sometimes unrelated items on a "free" table

- In addition to the interactive exhibits, we offer inquiry-based hands-on takeaway projects for school tours and museum visitors
- It is the visitor's favorite part of the museum (typically)
- Only participants' own artwork
- Projects which the visitor creates at a station - e.g. drawings and paper modes
- Sometimes - activity sheets. Area is also used during Family Day for selected activities, which have takeaways
- Sometimes we do. Brochures or maps or pins stickers, etc
- Usually text summarizing exhibition themes or maps and definitions of terms/symbols that also can be used while touring exhibition
- We plan to have self-guides for art gallery
- Yes, handouts linking interactive space to art in the collections; self-guide family activities

Which educational theories, if any, influenced the development of your interactive exhibition space?

- A general appreciation of the fact that learning by doing is important, as is multigenerational learning
- Charles Wilson Peale [sic]
- Constructivist
- Constructivist learning theory, personal agency
- Constructivist theory, Reggio Emilia, John Dewey, Gardner's MI, Piaget/Vygotsky's stages of development/scaffolding; Falk & Dierking's Social Learning Model
- Falk and Falk, Debarik/Doering [sic], Hein
- Hands-on
- Hands-on science
- I couldn't remember a name to say. We forget theories once out of school and use best practices.
- I was not involved with the development of exhibition - I was hired one month before the gallery space opened
- Informal experiential education; learning styles; family learning together
- Piaget, Gardner, Serrell
- State park interpretive principles and a general sense that it was time to change
- The Discovery Center, at its inception, was heavily influenced by the maxims of Discovery and Experiential Learning.
- The work of George Hein at Lesley University... and John Dewey

- Unsure. I am new to the museum and do not know what the curator's of past exhibitions intentions were
- We were a case museum with no hands-on for children. We needed to make the museum friendly to children.
- Whole body movement, activities that span ages, "family unit" learning' "pretend play" learning

What were your educational goals in the design of your interactive exhibition space?

- As for March 2005, I am trying to make the space a connection to the galleries of the museum. I'm trying to develop the ways the art collection is present and opportunities for families to express themselves creatively
- Engage visitors while introducing them to different technologies/optical devices
- For visitors to gain a deeper understanding rather than a "scattered" visit
- Gardner - multiple intelligences, Hausen [sic] - aesthetic development states
- Make people curious
- More focus on children & families
- Provide alternative ways to access information. Provide a multi-disciplinary experience
- Sometimes its for understanding or thought provoking or creativity, etc
- The Discovery Center interactives were intended to bring general concepts like adaptation to life while a Gallery Interpreter provided visitor instruction. The D.C. also intended its interactives to be an opportunity for visitors to touch the real thing.
- To create an interactive learning space for families that explores a real family & people from the American West
- To demonstrate first hand the experience of taking a train to work, school, or play
- To encourage people of all ages to touch and experience music regardless of their age or proficiency level
- To give children and students an opportunity to interact with history. Touching is an important way to learn.
- To give families a place to explore and learn together, since much of our museum is "no touch"
- To give visitors a better understanding of coastal resources.

- To provide a hands-on environment for family exploration that engages adults and children in meaningful interactions, which lead to multifaceted discoveries about the Getty collection
- To provide multi-modal learning activities, to encourage children and families to make discoveries individually and together
- Touching, exploration, using all senses
- Unknown yet
- Update exhibiting discovery center to meet ADA specifications and to meet expectation of teachers who requested more interactives.
- We have not had an interactive space since I have been here. In the future, I hope that visitors gain a deeper understanding and appreciation for the exhibitions we present through an interactive space

What is the role of collections in your interactive exhibition space?

- 1) Interactive space for novice visitors - both children and adults - that offers in-depth opportunities for experience and respond to works of art. 2) Interactive media stations will provide opportunity for visitors to engage physically/mentally through multiple senses.
- Adjunct role - specimens on display
- Artifacts which could be "sacrificed" were included. (Aircraft, cockpits, etc)
- Collection and reproductions included to prompt responses and engage participants. To encourage family visitation to perm. coll.
- Collections create visual stimuli for audio tracks
- Collections either has items we can use or not to create our space
- Featured "bookends" to the experience
- I am trying to make connections to our collection through puzzles which are images of objects on display and a DVD that flashes part of our collection onto a screen
- In my opinion the daily interpretive programming of the Discovery Center is monopolized by the living collections and the Insect Zoo. Between the hours of 10am and 2pm the D.C. provides presentations to school groups that are either live animals (from living collections) or insects and other invertebrates (from the insect zoo). Interpretive programming that spotlights the museum's primary collection presently don't [sic] exist. We offer no formal presentations to the students about paleontology, geology, or anthropology. These disciplines are represented in the D.C. but are left for children to discover on their own; knowledge acquisition about these

subjects is unmediated by a museum educator or formal programming. This is rather unfortunate and my top priority to address.

- Inspiration for creating an interactive. Egyptian area. Collections of physical & cultural artifacts have been used to cast replicas for interactive education.
- Interactive stations and hands-on activities often accompany art exhibits
- Necessary
- No permanent collection -- interactive spaces are tied to current exhibitions
- The collections are not used in the hands-on areas. The designer recreated materials to use in this area.
- The interactives relate to and enhance the objects on display from the collection
- They assist with the handling and installation and inventory of primary resources
- They do paperwork for incoming/outgoing loans and donations
- They form the conceptual basis for the interactive activities, but are represented in reproduction; no originals
- Unknown yet

What worked well in the design of your interactive exhibition space?

- Being able to restore, maintain and operate our artifacts
- Collaboration with colleagues is essential
- Components with open-ended activities, physically and intellectually multi leveled, some component encourage social interaction.
- Each activity is based on an artwork in the collection that is next to the activity
- Hands on, multi user, multi generational in these sites
- Immersion environments
- Interpreters on the floor
- Intuitive nature of the design; art-making activities w/ takeaways; limited use of text; active, open-ended approach; full-bodied physical activities like 3-D sculpture building and replica of a period bed; sophisticated design won an AIA award for interior space
- Ironically, the best interactives in the Discovery Center are those which required little to know interpretation by a Gallery Interpreter. Sections like our fossil dig were designed so well that children need not ask what to do, how to do it, or what should they learn from doing it. By comparison, an object like a fossil, sitting all alone, decontextualized and offered

without an interactive, frequently fails. The fact that it is real and touchable means nothing to the children. When forced to make a decision as to whether they want to hold and contemplate a static object or work with an interactive, they frequently choose the latter citing the former is just plain boring.

- It's near the admissions desk so is easy to monitor
- Labyrinthine layout, variety of subject material and display techniques
- Lighting, heating, cooling
- Overall flow
- Simplicity - intuitive design
- Space & seating for parents, gallery's location near restrooms, classrooms, and half way point of museum. Exhibits real airplanes are visitor favorites.
- Teamwork of education & curatorial departments (and exhibit dept)
- The fact that children can use these areas safely and not have to monitor them all the time.
- Unsure
- We are still working on our design. The concept for the space to be fluid, things to move, and nothing fixed.

What were the challenges, if any, in the design of your interactive exhibition space?

- Cords and headphones/having enough room for everything
- Different sounds close together. Reliability
- Enough to do with broad expanse of age, appropriate activities
- Funding is the greatest obstacle
- Getting visitors to read text/directions
- I have no information on the challenges of the design of the interactive exhibition space.
- Limited space; high attendance rates vis-à-vis square footage; creative space use that maintained fire code compliance; creating components that would work for both young & older children; designing the space to involve adults in addition to kids
- Maintaining an operating railway is time, labor and financially intensive. Safety is a major factor
- Maintaining audio/visual components created by out of house firm
- Money
- Money space time
- Money, time, space (lack of)
- Not sure yet

- Our designer had the challenge of working w/ what money we had at the time. We still have more money to raise.
- Planning & implementation time. Costs
- Rough treatment of artifacts, noise of wind tunnel fans heard in classroom, fitting 737 segment through gallery entrance
- So far, pinning down a strategy
- Space is in a historic building. An elevator for wheelchairs (to maneuver up and down a short stairway) is challenging. Also, the only restrooms are on the first floor, far away from the children's area.
- Through our evaluation, the space does not engage for very younger (longer) children older than 8 year old
- We have relatively small galleries, so there is not much room

Has the opening of your interactive exhibition space altered visitor demographics?

No	1	7%
Yes	6	43%
Unsure	7	50%

If yes, how?

- #s are lower than before
- Although, findings from surveys of general visitors and children's gallery visitors difficult to compare. Visits by families during weekdays has increased.
- Changing temporary exhibits have added a new additional visitor to the museum - those interested in art!
- Families with young children visit more often, became members
- Not open yet -- 2007
- Not sure yet
- People are curious about our unconventional approach to museum display
- The areas are spacious so that the visitor is not interrupting the space by walking by.
- The Discovery Center, due to its extreme popularity with children, has brought more family groups to the museum. Parents of children ages 1-7 have targeted this gallery as their primary reason for coming to the museum. Many parents pay the museum admission on a weekly basis only for access to the D.C! Other parents have chosen to utilize the D.C. as a place to have "New Mommy" gatherings and birthday parties for their children on the weekends (unfortunately we had to end the birthday party

program due to constant overcrowding on the weekends.) I used to think that the D.C. was popular with pre-K thru 3<sup>rd</sup> grade school groups. I now believe that our attendance is so high with this demographic during the week because of the D.C.'s relationship with the Insect Zoo. The contents of the latter is a direct hit on the California Science standards for these grades; the D.C. and its contents are more apposite [sic] for 4<sup>th</sup> and 5<sup>th</sup> graders (who constitute only 20% of our school audience). Museum regulations require school groups wishing to visit the Insect Zoo to make a reservation with the Discovery Center through the museum's School Visits Department; the Insect Zoo visit is complementary once the D.C. reservation is made. Pre-K thru 3<sup>rd</sup> grade teachers have personally told me that the only reason they are at the museum and D.C. is to, "See the insects." It would be interesting to see what would happen to the Discovery Center if reservations to the Insect Zoo could be made separately.

- There was an increase of children which has remained steady
- We appeal to a broad audience. I.e., on audience representative of our ethnic demographic.
- We offer an experience few other institutions can

Are there interactive exhibition spaces in other museums that have inspired you?  
If yes, which?

- Children's museums as a genre; Arizona Museum for Youth. Others informed our decisions, though didn't "inspire"
- Exploratorium, Phoenix Art Museum, Boston Museum of Art, SFMOMA
- Indianapolis Children's Museum, Springfield Illinois Children's Museum, Magic House
- LA Children's Museum, BC Museum of Natural History
- LACMALAB @ Los Angeles County of Museum of Art (Bob Sain, curator); Natural History Museum of LA project by Vanda Vitaly (curator)
- Minnesota History Center in St. Paul, MN
- Monterey Aquarium
- Monterey Bay Aquarium
- No
- The Huntington Library and Botanical Gardens new atrium (2006), The Children's Museum of Manhattan, The Indiana State Museum (Definitely)
- Yes, but no specific ones
- Yes, hieroglyphic rubbings at LACMA, Museum of Jurassic Technology
- Yes, too many to count

## Appendix D

### List of Interviewees

Anonymous  
Anonymous  
Museum Educator

Jon Betthauser  
Independent Consultant  
Exhibit Designer

Tim Smith  
One + Two, Inc.  
Senior Designer

Sara Smith  
Amaze Design  
Director of Exhibit Development

Peter Exley FAIA  
architectureisfun, Inc.  
Director of Architecture

Frank Migliorelli  
ESI Design  
Director of Interactive Design

Marjorie Prager  
Jeff Kennedy Associates  
Director of Planning & Interpretation

Addy Froehlich  
Lehrman Cameron  
Design Associate

Abby Kliger  
Pacific Studio  
Associate Designer

Donald Sibbett  
The Sibbett Group  
Design Principal

Andrea Weatherhead  
WEATHERHEAD Experience Design Group, Inc.  
President and CEO

Sari Boren  
Wondercabinet Interpretive Design, Inc.  
Principal and Exhibit Developer

Jenny Sayre Ramberg  
Monterey Bay Aquarium  
Exhibit Developer/Writer

Anne Henderson  
Frist Center for the Visual Arts  
Director of Education

James Clark  
Natural History Museum of Los Angeles County  
Discovery Center Supervisor

Caryl Marsh  
Consultant

Judy White Marcellini  
Educator

Mary Alexander  
Educator

Janet Kamien  
The Museum Group  
Independent Museum Consultant  
Specializing in Planning and Exhibition

Susy Watts  
Independent Consultant

Vas Prabhu  
Peabody Essex Museum  
Deputy Director of Interpretation and Public Programs

Kathleen Hamilton  
San Diego Museum of Man  
Curator of Education

Katherine Ziff  
Formerly, Bay Area Discovery Museum  
Exhibit Developer

Product

**Rediscovering Discovery Rooms:**  
*Steps for creating and re-thinking family-friendly  
interactive exhibition space in museums.*

# Rediscovering Discovery Rooms

*Steps for creating and re-thinking  
family-friendly interactive  
exhibition space in museums.*

**For further questions, please contact:**

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John F. Kennedy University  
M.A., Museum Studies 2006

Thesis:  
*Rediscovering Discovery Rooms: Creating  
and Improving Family-friendly Interactive  
Exhibition Spaces in Traditional Museums*

When your museum serves family visitors, you are not only fostering the growth of your current audience but also engendering a love of museums for future visitors. In order to create a family-friendly institution, it is important to understand that family learning takes place through conversations and collaborative activities in small groups.

The following suggestions for creating discovery rooms that foster this kind of learning are the result of my master's project for John F. Kennedy University in Berkeley, CA. For my master's degree in museum studies, I focused my research on discovery rooms and making museums more family-friendly.

Thank you for using my research to help guide you through the process of creating or improving your discovery room.

— Lindy Villa, July 2006

The following 11 key steps will help you to create or improve your discovery room. Although these steps may seem obvious, my research revealed that most museums neglect them.

**Step 1:** Consider your audience

**Step 2:** Assess your institutional readiness

**Step 3:** Revisit your institution's core assets

**Step 4:** Articulate a clear vision for the project

**Step 5:** Develop a plan of action

**Step 6:** Encourage intergenerational learning

**Step 7:** Create a family-friendly discovery room

**Step 8:** Establish a family-friendly institution

**Step 9:** Sustain a family-friendly institution

**Step 10:** Evaluate ... and start again

**Step 11:** Keep discovering

## Step 1: Consider your audience

### Are family audiences compatible to your institution's mission?

- Encourage staff to learn about family issues and needs
  - Discuss intergenerational learning at staff meetings
  - Provide a list of resources and literature on families in museums to staff
  - Publicize and encourage attendance to conferences and colloquia
  - Examine outside institutions as examples of family-friendly institutions and programs
  - Post articles on family learning in the staff lounge
- Research your audience
  - Examine your current audience
  - Identify your target audience
  - Identify an audience you would like to attract
    - Keep in mind that the “content buffs” will always come
  - Understand the needs, desires, feelings and strengths of families and the community
    - Assess family needs in relation to exhibits and programming
  - Form community advisory groups such as a Parent Advisory Committee
  - Do not use “children” in the title of your space if you wish to attract the general audience or older children who may see the title as babyish
  - Review visitor demographics and membership demographics
  - Investigate the needs of external stakeholders
    - Teachers, Homeschool families, etc

NOTES:

## Step 2: Assess your institutional readiness

### Is your museum ready to create and maintain a discovery room?

#### □ Ensure institutional commitment

- Acquire full buy-in from key internal stakeholders
  - Executive Director
  - Board Members
  - Staff
  - Volunteers
  - Major Donors or Sponsors (if applicable)

#### □ Commit appropriate resources

- Secure adequate startup and maintenance resources
  - Adequate space of discovery room (at least 14% of total exhibition space)
  - Budget
  - Project timeline
  - Staff/Consultants
- Ensure resources are available throughout the life of the discovery room
  - Creation
  - Sustainability
  - Maintenance and upkeep
  - Evaluation
  - Upgrades

NOTES:

### Step 3: Revisit your institution's core assets

#### Do you have a solid understanding of your museum?

- Revisit and reacquaint yourself with your museum
  - Mission statement
  - Educational philosophy
  - Vision statement
  - Educational goals
  - Values statement
  - Strategic plan
  - Diversity statement
  - Interpretive plan
  - Communication plan
  - Collection
    - Specific items in collection
    - Unique items
    - Iconic items
- Revisit and reacquaint yourself with your exhibits and programs
  - Some questions to consider: Do your exhibitions and programs...
    - Build and maintain the confidence and competence in adults' family roles?
    - Build on strengths of the family as a whole as well as its individual members?
    - Welcome all family members and diversity within families?
    - Support the growth and development of young children?
    - Support the role of parents and caregivers?

NOTES:

## Step 4: Articulate a clear vision for the project

### What is the purpose of your project?

- Identify the purpose and intention of the discovery room
  - Understand why you are creating a discovery room
    - Main purpose
    - Vision for project
    - Concept plan
  - Identify what you hope the discovery room will achieve
  - Define terminology (i.e. interactive, success)
  - Relate discovery room components to:
    - Mission
    - Collection
    - Community
  - Design an interpretive plan
    - Main message
    - Content outline
    - Narrative
    - Appropriate exhibit technique for telling narrative
- Identify your educational goals and learning outcomes
  - Identify target audience
  - Outline intended visitor actions
  - Identify what you want visitors to learn in the space
  - Define which messages you want visitors to receive
  - Specify educational goals
  - Devise learning outcome indicators
  - Conceptualize visitor experience

NOTES:

## Step 5: Develop a plan of action

### How will you manage the goals of your project?

- Identify your project goals and plan of action
  - Define project goals
  - Select which resources you are using and why
  - Understand the staff impact of creating and maintaining such a space
  - Strategize a plan to train staff
    - Which staff get trained
    - Who will do the training
    - How staff will get trained
  - Devise a plan to secure funding for evaluation and maintenance

### □ Assemble project team members

The project team should include expertise in the following perspectives:

- Education
  - Understands learning theory
- Floor Staff
  - Understands the visitors' likes, abilities and behaviors
- Facilities, Operations, Maintenance
  - Understands who and how to maintain the museum
- Curator
  - Understands content
- Collections
  - Knows what is in the collection and its condition
- Exhibit design
  - Understands exhibit design
- Graphic design
  - Understands graphic design
- Marketing
  - Understands how to promote and build an audience for the discovery room
- Development and fundraising
  - Represents the opinions of sponsors and donors as well as knows how to secure funding
- Community liaison
  - Represents the perspectives of the community

□ Assign project team leaders

Project team leaders should fully understand their duties. The project leader and decision maker do not necessarily have to be two separate people.

- Project Leader
  - Keeps priorities in order
  - Manages deadlines
  - Manages budget
  - Leads meetings
  - If working with an outside firm, serves as contact person who
    - Disseminates and filters ideas
    - Synthesizes needs of the museum
    - Mediates between outside firm and museum
- Decision Maker
  - Creates a decision-making system
  - Understands how to reach consensus
  - Has a method for reviewing work
  - Has ultimate say in decisions
    - Understands communication plan
    - Understands project goals
    - Signs off on stages of the project

□ Decide if you will hire an outside firm or create the space in-house

Exhibit designers and developers suggest the following rules to adopt when working with an outside firm:

- Understand the RFP (Request For Proposal) process
  - Learn how to write an RFP
  - Expect firm to submit proposals, not completed plans
  - Define your terms and expectations clearly
  - Develop criteria and a team to select the most appropriate proposal
- Don't judge firms by price alone
  - A firm may negotiate price if they want to work on your project
  - Check references
  - Stick to your criteria, don't be swayed by emotion
- Involve all necessary staff members in the project from the start
- Appoint a sole contact person to liaison with firm
- Be overt and admit problems
  - Let the firm know if you don't have goals or a decision-making process
  - Allow firms to help you decide between options
  - Be willing to listen to alternative points of view

- Have realistic expectations for challenges
  - Understand that discovery rooms are expensive to create and operate
  - Prioritize how you want to allocate your budget
  - Include at least 10% of budget for prototyping and evaluation
  - Include at least a 10% contingency for last minute incidentals
- Have realistic expectations on time
  - Understand that the entire project from start to finish can take months or even years
  - Meet deadlines in order to prevent delay
- Understand that making alterations to project components that were already “signed off” will create delays and increase costs

NOTES:

## Step 6: Design an environment for social learning

### How can you *create* a space that promotes intergenerational learning?

- Create concrete educational goals
  - Identify main messages
  - Identify learning indicators
  - Create learning objectives
  - Articulate desired visitor actions
  - Articulate what you want the visitor to understand

- Consider the following design interface characteristics

The following characteristics of a successful discovery room were informed, in part, by research, including the PISEC Study (The Philadelphia-Camden Informal Science Education Collaborative):

- Approachable
  - Allows visitors to feel they can easily accomplish the task
- Intuitive
  - Allows visitor to quickly understand how to perform activity

- Easy to understand
  - Uses simple language and defines terminology in small segments
- Challenging
  - Requires visitor to actively engage in activity
- Doable
  - Outcome or answer is possible to obtain
- Open-ended
  - Allows for multiple answers, outcomes and interpretations that will foster group discussion
- Responsive
  - Demonstrates a direct one to one correlation between action and reaction
- Straightforward
  - Allows visitors to understand main message by teaching one thing clearly
- Multi-layered
  - Allows visitor to return and interact with it in a different way
- Developmentally-appropriate
  - Arrange exhibits and activities for various ages and abilities next to one another in order to address all abilities and intellect levels of a multigenerational group

- Multi-sided
    - Allows family to cluster around and view exhibit
  - Multi-user
    - Allows for several sets of hands (or bodies)
  - Physically accessible
    - Can be used comfortably by both children and adults
  - Multi-modal
    - Appeals to different learning styles and levels of knowledge
  - Relevant
    - Links activities to visitors' prior knowledge and experience
- Consider the following design features and exhibit components
    - Appeal to adult sensibilities
    - Design activities that are linked to each other and build on a theme
    - Encourage socializing and cooperation
    - Reflect the voice of institution
    - Display exhibit at a child's height or provide steps for children to see
    - Integrate seating arrangements
    - Create an area for quiet contemplation and reading
    - Cluster seating and tables in small groups for collaboration
    - Create a collection or display method for handouts and takeaways
    - Design for good acoustics
    - Meet or exceed ADA requirements

□ Carefully craft text – Signage and Interpretive Labels

- Use visible and legible font
  - E.g., Times New Roman
- Use large text for children learning to read and seeing impaired
  - Minimum of 20-point type
- Make bold or color code action verbs
- Reflect on what your text says
- Watch the voice and tense
  - E.g., first person account
- Use simple words and pictures
  - Easy for adults to paraphrase
  - Easy to read aloud
- Use concise language to get message across quickly so that visitors are comfortable reading while standing up
  - 50 words or less
- Layer information
  - Provide information in a variety of ways and formats
  - Use text as a conversation starter
  - Begin with a simple concept – the thesis
  - Start with a question or a challenge
  - Start with visual, concrete information and end with abstract
  - Break information into small, easily understood paragraphs (25-50 words each)
  - Give prompts for parents and caregivers (E.g., Hey Parents!)
- Increase complexity and information in subsequent paragraphs
- Answer the “so what?” – why you did what you just did
- Use imagery that stimulates curiosity and offers insight into the main body of the text
- Use image captions that give concrete information
- Ensure that all graphics and labels are well lit and not in the shadow
- Use question and answer format carefully
  - Do not feed the visitor the answer
  - Allow visitor to figure out the answer with the information you provided them
  - Do not ask questions that are too far out of reach or easy to answer
  - Provide a sense of challenge so that visitors use deduction to figure out the answer

□ Carefully craft text – Instructions for Activities

- Enlarge titles
- Give straightforward directions
  - E.g., Stop. Look. Turn right.
- Explicitly state what visitor is expected to do
  - E.g., Match, Touch, etc
- Divide into easily-understood segments
- Put simple commands in bold
  - E.g., **Match**
- Present concrete information
- Relate to visitor's firsthand experience
- Answer the question, "so what?"

NOTES:

## Step 7: Design a family-friendly discovery room

### How can you create a space that addresses family needs?

- Consider aesthetics
  - Reflect the aesthetic of the rest of the museum
  - Select sophisticated color tones and materials
  - Invite and welcome to families
  - Create a fun and engaging atmosphere for children
  - Appeal to adults as well as children
- Provide the following amenities
  - Furnish with a seating area - benches and chairs with arm rests
  - Arrange areas to work together as a group - chairs, tables and stools of varying sizes
  - Provide cubby holes to store belongings
  - Provide coat hooks
  - Design a space for stroller parking
  - Design a quiet area for breast feeding or as a "cool-off zone" for tantrums
  - Build the discovery room near:
    - Restrooms with changing tables
    - Café and refreshments
    - Eating area and water fountain
    - Museum shop

□ Add more safety features

In order to build trust with the museum, families must feel safe, secure and comfortable.

- Keep line of sight open throughout discovery room
- Run a background check and check references for staff w/ direct responsibility for children
- Train staff in first aid
- Equip staff with walkie talkies
- Supervise play areas and keep them well-staffed during public hours
- Make sure room is well lit, natural lighting if possible
- Hide or plug electrical outlets
- Provide clear guidance/signage on what can and can not be touched
- Ensure stairs are safe by providing:
  - Low-rise stairs
  - Handrails
  - Alternatives to stairs such as elevator or ramp
- Keep heavy doors open or have an automatic button, which is kept out of children's reach, to open doors
- Use large, legible text with symbols and icons such as arrows or restroom for all signage
- Provide adequate space around exhibits
- Provide adequate way finding
- Check for choking hazards

- Clean and sanitize components daily with non-toxic cleansers
- Use environmentally-safe and non-toxic materials
- Regularly check for safety and maintenance

NOTES:

## Step 8: Sustain a family-friendly discovery room

### How can you *sustain* a space that promotes intergenerational learning?

- Offer Takeaways/Handouts such as
  - Family-friendly map
  - Family guide to the exhibitions
  - Summary of exhibition text
  - Definition of terms and symbols
  - Fun and weird facts
  - List of activities for families to do at home
  - List of state curriculum standards
  - List of references or materials for further information on the exhibition, museum or other family activities in the community

NOTES:

- Staff the discovery room
  - Staff during all public hours
  - Provide ongoing training for staff
    - Welcome visitors
    - Model museum behavior
    - Facilitate activities
    - Encourage visitor participation in activities
    - Model learning behavior (such as scaffolding and inquiry)
    - Engage in learning conversations
    - Use questioning strategies
    - Be up to date with learning theory or educational methods
    - Develop rapport with children and families
    - Get to know “regulars”
  - Educate staff about safety and security issues
    - Reinforce rules
    - Know lost child policy
    - Know museum’s family friendly amenities, facilities and programs
  - Involve in and/or informed of evaluations
  - Provide staff with a clear understanding of oversight/management of discovery room
  - Encourage staff to give feedback and suggestions for improvement
  - Encourage staff to share visitor comments and suggestions for improvement

## Step 9: Establish a family-friendly institution

### How can you make your museum more appealing to family visitors?

The following family-friendly characteristics are adopted from children's museums, but they apply to all museums. Your interactive exhibition space should reflect your museum's mission, collection and community. These recommendations will allow you to create a more welcoming and appealing experience for family visitors throughout your museum.

- Assess your admission and membership fees
  - Offer coupons, discounts or free admission days
    - Senior Discount
    - Free for children under 5
    - Discount for more than 1 child
    - Children free with adult
    - 2 for 1 admission
  - Offer a family-level membership
  - Provide family-friendly benefits
    - E.g., Member's Mornings
    - Family Days
- Alterations begin in the parking lot
  - Display clear road signage to museum and back to main street/freeway
  - Ensure that walkways are clean and well lit
  - Secure outside areas with fencing, walls, etc to create boundaries
  - Clearly mark parking spaces
  - Widen parking spaces to allow for taking out stroller or child from car seat
  - Provide adequate lighting in parking lot and building
  - Display signage clearly indicating museum entrance and admission booth
- Ensure the museum entrance is warm and welcoming
  - Design a discovery room with one entrance/exit or have it monitored by staff
  - Provide a coatroom
  - Establish lost child procedures
  - Train staff in handling children and families
  - Display information on daily programs
  - Update staff on museum's family friendly offerings and programs

- Provide more orientation and wayfinding
  - Display a map of museum and galleries
  - Use clear, directional signage for restrooms, exits, etc.
  - Display signage for discovery room throughout the museum
  - Provide a calendar for family-friendly events and programs

- Add family-friendly programs and events

Programs for families should be regularly scheduled on a specific day and time. Also take into consideration school holidays, break and vacation.

- Docent tours for families
- Self-guided family tours
- Family programs
- Special events
- Family Days
- Reading lounge contains children's books and activities
- Summer camp
- Sleepovers

- Attract intergenerational visitors with marketing

In my research I found that marketing campaigns and promotional materials confuse visitors if they do not define the intended target audience and accurately represent the discovery room as a place for *all* visitors.

- Identify families as target market
- Use images of families and children of all ethnicities in promotional materials
- Describe discovery room and museum as a place for all ages
- Promote family programs, events and discounts
- Advertise in parenting magazines, bulletin boards, newsletters, organizations, websites and publications

- Adapt restrooms for family visitors

- Clean restrooms regularly
- Supply a changing table in both gender restrooms
- Provide a diaper pail or trashcan
- Ensure large stalls to fit families with strollers
- Equip stalls with a coat hook or purse shelf for diaper bag
- Furnish with low sinks, toilets, dryers, towels or small step stool
- Stock with paper towels

- Add family-friendly amenities in the café
  - Offer a selection of healthy snacks
  - Offer snacks and meals at affordable prices
  - Provide high chairs and booster seats
  - Offer children-friendly utensils such as plastic knives, cups and straws are available
  - Provide the ability to warm bottle or food
  - Allow visitors to eat snacks from home
  
- Entice families to purchase items in the museum store
  - Sell diapers and wipes
  - Sell children's books, toys, activities and souvenirs (ex. children's sized t-shirts)
  - Sell a selection of \$5-10 gifts for small purchases (for grandparents and new parents on fixed income)
  - Place small items, which are choke hazards, on high shelves

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## Step 10: Evaluate ... and start again

### How do you know you've achieved your project and educational goals?

#### □ Understand the types of evaluation

It is highly recommended to perform peer reviews- where exhibit designers, exhibit developers and evaluators from other institutions evaluate your discovery room. The following is an adaptation of evaluation types as described by John Falk and Lynn Dierking in *Evaluation: A Checklist*

- Front-end Evaluation
  - Typically occurs during the initial planning phase of discovery room development
  - Provides information about visitors' interest, expectations, and understanding of proposed topics
- Formative Evaluation
  - Takes place while exhibit is being developed
  - Provides feedback about the effectiveness of an exhibit, and its components -- feedback which allows the team to make informed decisions as they continue to develop exhibit
- Remedial Evaluation
  - Typically occurs once the discovery room has been installed, oftentimes before the exhibit is entirely completed
  - Focuses on determining changes which need to be made to improve the exhibit
- Summative Evaluation
  - Conducted after discovery room is completed
  - Seeks to determine the extent to which goals were met
  - Often done by an outside evaluator to obtain an unbiased view for funders/sponsors.

□ Perform the following evaluation steps

- Determine budget, resources and time frame
- Research other institutions' evaluations
- Identify what you want to evaluate
- Identify what you want to find out
- Determine best method for collecting data
- Use a representative sample of your audience
- Ask relevant questions
- Collect data systematically
- Summarize data in a written report
- Distribute report to staff members, consultants and outside design firm
- Make appropriate changes according to results

□ Devise a plan for prototyping

The following framework is adapted from the Chicago Children's Museum for prototyping interactives:

- Proof of Concept
  - Should this component be included in the exhibition?
- Usability
  - Can the visitor figure out what to do from reading the instructions?
- Educational Effectiveness
  - Can the visitor tell us some version of the main message?
- Behavioral Effectiveness
  - Did the visitor perform the actions and behave as intended?
- Feasibility
  - Can it be constructed?
- Durability
  - Will it last over time as multiple visitors use it?
- Safety
  - Do visitors use this in a way that might pose a safety problem?

□ Consider the following tips for prototyping

- Prototype components with the target audience
  - In the gallery space where the discovery room will eventually be located
  - In school classrooms
  - In design firm
  - With general audience
  - With community advisory groups
- Involve staff members
  - To observe visitors on the floor
  - To hand out evaluation forms or questionnaires
  - To interview visitors
  - To share results of how space is being used and interpreted to all staff
- Collect visitor feedback (anecdotal evidence)
  - Comment book
  - Suggestions box
- Gathers necessary information including:
  - Easy to use directions
  - Visitor performs task as intended
  - Easy to understand text and graphics
  - Visitor identifies main message
  - Marketing effectiveness
    - How did you hear about the discovery room?

- How would you describe the space to your friends?
  - Visitor demographics
- And most of all, expect unexpected outcomes

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## Step 11: Keep discovering

**How can you keep discovering more about discovery rooms?**

- Stay connected with colleagues to learn about publications, conferences and resources about family learning and interactive exhibition spaces

NOTES:

## Glossary of Terms Used in this Project

The following definitions were obtained from articles and other literature on learning theory and educational philosophy.

**Activity boxes:** A box of related objects to be interpreted through accompanying materials, such as booklets, games, cards or questions. Each box is a small, interactive activity with labels, instructions and supporting materials. Boxes can be used on site or checked out for a period of time.

**Artifakes:** Objects meant to replicate priceless and fragile objects in the collection, generally to be touched by the visitors.

**Collaborative learning:** Learning that takes place in groups when learners perform the same task simultaneously and problem solve together. The discovery or exploratory process is shared among members of the group. Such learning includes the sharing of tasks, skills, abilities and authority.

**Concept-based learning:** Learning through an understanding of main concepts.

**Constructivism:** The idea that individuals construct or make their own meanings and understanding of the world through prior knowledge and reflection on experiences and beliefs. Constructivism takes into account the visitor's prior knowledge and intelligence and ensures that the visitor is engaged and that learning is active and accessible.

**Didactic learning:** Learning facts and figures through reading or lectures. Didactic learning is associated with classroom style learning in which the goal is to remember specific facts and information.

**Discovery:** The uncovering of information or finding of connections and forming opinions based on exploration.

**Discovery cart:** A cart with objects on it for hands-on learning. Usually staffed with an educator to facilitate games, activities or ask questions.

**Discovery room:** A separate area, within the context of a traditional museum, that features activities, objects, artifacts and exhibits to provide visitors with hands-on discovery experiences. Also known as: family gallery, discovery space, discovery gallery, family gallery, exploration room, children's room, children's gallery, etc.

**Discovery-based learning:** Learning through discovery of information by individual learners or small groups. In discovery-based learning, tasks are generally performed unassisted or with little help or guidance; answers are never given. Muska Mosston specifies ten cognitive operations that might take place as the learner engages in active inquiry: recognizing, analyzing, synthesizing, comparing and contrasting, drawing conclusions, hypothesizing, memorizing, inquiring, inventing, and discovering.

**Evaluation:** Assessment of the effectiveness of a program or exhibit in achieving its objectives. Judging the process and outcomes on established criteria; evaluation relies on the standards of project design and aims at program improvement through a modification of current operations. Can include formal and informal evaluation: evaluation forms, personal interviews, prototyping sessions, comment cards, etc.

**Experiential learning:** Learning through new personal experiences and reflecting upon how these experiences fit the framework of past experience. Experiential learning refers to an individual's growth and change through time.

**Exploratory learning:** Learning through exploration and experimentation with objects, senses and activities to uncover relationships and unexpected lessons. It is associated with developing generalized thinking and problem-solving skills.

**Family:** An intergenerational group of two or more casual visitors consisting of at least one adult aged 18+ and one child, including but not limited to parents, grandparents, caregivers, teens, children, infants and multiple siblings or friends.

**Family-friendly:** Having the qualities necessary to appeal to, engage and cater to the needs of families.

**Family learning:** Learning that is mediated through social interaction within the family when all family members are engaged and actively participate.

**Flow:** A spontaneous feeling of complete focus and immersion in an activity, with a high level of enjoyment and fulfillment. Often refers to intrinsically motivated activities.

**Free choice learning:** Learning experiences that are voluntary, self-directed and guided by the learner's needs and interests.

**Hands-on:** Physical interaction with the exhibits, which involves active participation and the ability to touch and manipulate objects. The goal is to provoke critical thinking skills, acquire understanding, and construct meaning.

**Hands-on learning:** Learning through kinetic activities that directly involve and engage the learner with the material.

**Inquiry-based learning:** Learning through the active seeking of answers to the learner's own questions. For the student, the learning is personally relevant as well as both intrinsically motivated and self-directed by curiosity.

**Interactive:** Implies mental engagement but not necessarily physical interaction. In other words, interactive elicits a response or reaction from the visitor; promotes an exchange of information or opinions and allows physical exploration of objects that involves choice and initiative. For the purposes of this project, interactive does not mean computer technology or programs.

**Interactives:** Exhibit components that are interactive (see above).

**Intrinsic motivation:** Doing an action for its own sake. Motivation is self-created and based on the enjoyment of the behavior itself rather than external or extrinsic rewards.

**Manipulatives:** Physical materials such as blocks, tiles or other objects that are manually manipulated to construct forms and solve problems.

**Minds-on:** Promotes active thinking and questioning, generally used when touching is not allowed.

**Multiple intelligences:** Howard Gardner's theory that there are eight intelligences: verbal-linguistic, musical-rhythmic, visual-spatial, logical-mathematical, bodily-kinesthetic, naturalist, interpersonal, and intrapersonal. An individual has her own combination of intelligences that work together dependently. Because of this, people do not all learn in the same way.

**Prototyping:** Systematic testing of the design, features and functionality of an exhibit to find errors, solve problems, and gather visitor comments and feedback. Prototyping evaluates the overall idea and concept.

**Scaffolding:** The act of adults or skilled experts as helpers in guiding a child to grow intellectually. Related to the zone of proximal development.

**Stumpers:** Unusual objects that visitors will not know and will think are strange. Stumpers are used to evoke curiosity and questioning.

**Zone of proximal development (Zoped, ZPD):** Lev Vygotsky's term for the time between which a child can solve a certain problem only with help from another and the time when the child can solve the same problem independently. Vygotsky believed this was the crucial time for full social engagement of the child in order to achieve maximum learning.

## Suggested Reading

- Adams, Mariana and Jessica Luke. "From Heart to Head to Hand: A Synthesis of Issues & Strategies Raised at the From Content to Play Symposium," presented at the J. Paul Getty Museum Symposium, From Content to Play: Family-Oriented Interactive Spaces in Art and History Museums, June 4-5, 2005. Found at: [http://www.getty.edu/education/symposium/Adams\\_Luke.pdf](http://www.getty.edu/education/symposium/Adams_Luke.pdf)
- Borun, Minda et al. Family Learning in Museums: The PISEC Perspective. Philadelphia/Camden Informal Science Education Collaborative, 1998. (Or Curator articles by Minda Borun)
- Falk, John and Lynn Dierking. Evaluation. [http://www.swmlac.org.uk/mli/eval/eval\\_checklist.htm](http://www.swmlac.org.uk/mli/eval/eval_checklist.htm)
- Kelly, L., Savage, G., Griffin, J., Tonkin, S. Knowledge Quest: Australian Families in Museums. Sydney: Australian Museum and National Museum of Australia, 2004.
- Villa, Lindy. "Rediscovering Discovery Rooms: *Creating and Improving Family-friendly Interactive Exhibition Spaces in Traditional Museums*." Master's Thesis. John F. Kennedy University, 2006.