Early Learning in Museums
A Review of Literature

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Abstract

This paper summarizes the results of research conducted in museum settings or in other locations using learning resources and materials designed by museums and that focuses on learning by young children. Only reports published in peer-reviewed publications between 2000 and the present are considered. This review indicates that: 1) museums, with their real artifacts, dioramas, and immersive exhibitions provide a uniquely positive environment to foster learning by young children; 2) young children are interested in artifacts and exhibitions in traditional museums and can learn disciplinary-specific information, such as history or biology, long before they encounter those disciplines in formal school settings; 3) young children approach artifacts and exhibits idiosyncratically based on their individual motives and interests; they learn by encountering real artifacts which they talk about with others, and about which they sometimes express their reactions in various verbal and artistic ways; 4) appropriate adult encouragement can enhance children's learning and exploratory behaviors in museums; 5) while researchers and museum professionals alike are convinced that young children are learning in traditional museums, research that details that learning is lacking. It is suggested that a new area of childhood research that examines the impact of museum-based learning on the development of young children has the reciprocal benefits of understanding children's development, and promoting their learning in new settings by adding museums to the traditional research settings of home and school. Such research can also advance understanding of the singular and collective contributions these three settings make to the holistic development of young children.

Introduction

Museums and Young Children

In recent years there has been a noticeable increase in the number and types of programs offered by museums for pre-school age children. Museums expressly designed for young children have been a mainstay in many communities – and for some, an essential community resource - since the founding of the Brooklyn Children's Museum in 1899. The immediate success of the Brooklyn museum in attracting the interest of young audiences and engaging their minds in science, nature, and world cultures from a young age inspired the founding of the Boston Children's Museum in 1913 and the Children's Museum of Indianapolis in 1925. According to the Association of Children's Museums (ACM), by 1975 there were approximately 38 children's museums in the United States.

Following the models in Brooklyn, Boston and Indianapolis, the first children's museums focused on programs that involved children in the study and presentation of collections and introduced urban children to nature. The Brooklyn Children's Museum, for instance, has always been a collecting institution. In the 1960's staff at the Boston Children's Museum revolutionized the traditional museum experience by getting objects out of cases and into children's hands in exhibit areas where children could interact, experiment, and follow their own curiosity. The appeal of the hands-on approach to learning for young children ignited a movement to create children's museums. In the United States, 80 new children's museums opened between 1976 and 1990. Since 1990, an additional 125 have opened. The ACM reports that currently there are approximately 78 children's museums in the planning phase. Today there are children's museums in urban, suburban and rural areas and virtually every state has more than one children's museum.

The obvious appeal and success of today's children's museums in attracting children and families and engaging them in joyful discovery experiences that instill an appreciation of our world, develop foundational skills, and spark a lifelong love of learning, is an American success story in innovative approaches to early childhood development.

As children's museums have evolved from their collections-centered beginnings to hands-on, multi-sensory learning environments, they have emerged as institutions that are distinctive from traditional collections-based museums that initially launched them. There is far more attention to young learners in children's museums than there is in traditional art, history, natural history and science museums.

Traditional Museums and Early Childhood Education

Is there a role for traditional museums in early childhood development? As research about the importance of the early years in developing the brains of children becomes more widely disseminated, and as the associations between the development of the brain and cognitive, social and emotional development become understood, attention to learning opportunities for children before enrollment in kindergarten has gained world-wide attention.

Traditional museums are increasing their services for very young children. A review of responses to a survey of all of the education offerings provided by the 170 Smithsonian Affiliate museums[1] identified 22 museums with early childhood programs or initiatives that, based on the descriptions provided by the museum, were classified as strong attempts by the museum to serve a young audience. Nearly half of the programs are offered by science museums or science centers. Only three of the programs were offered by art museums, and two programs were offered by history museums.

The majority of museum programming focuses on classes and tours for pre-school groups and on professional development for early childhood educators. The primary emphasis is on the expertise and resources of the museums to facilitate hands-on learning; science is the most frequent program topic. A secondary audience is families and caregivers with young children; museums offer workshops and special events for this audience. Only two of the 22 museums reported having learning stations for young learners throughout the museum.

The emerging question is: what can traditional museums contribute to the positive development of young children? In order to demonstrate that traditional museums can contribute to early learning, they must make the case that they are not only places for fun family outings and occasional pre-school field trips, but that they provide the kinds of learning experiences and environments that contribute to the social, cognitive and emotional development of young children. The primary purpose of this literature review is to ascertain if there are compelling research findings to support this claim.

Structure of the Report

The questions that guided the literature review are:

(1) What research has been conducted about how children ages 8 and under learn in traditional museum settings?

(2) What research has been conducted about the outcomes for children ages 8 and under who engage in learning in traditional museum settings?

[1] Christina DiMeglio Lopez, External Affairs Officer, Smithsonian Affiliations, coordinated a review of information about early childhood programming provided to the Smithsonian via responses to a survey sent to all 170 members of the affiliates network.

In the process of this review it became apparent that several issues had to be addressed before answering the questions about how and what children learn in traditional museums. The first of these issues is the suitability of traditional museums as places for young learners. Second, is the question of the role of adults in young children's learning. Is interaction with adults essential for a child's learning or can a young child direct his or her own learning? The third issue concerns whether traditional museums are suitable settings for formal learning as well as informal learning. Can museums, for instance, help prepare young children for kindergarten? The fourth issue is whether adequate measures are available to identify the contributions that museums make to young childhood development.

These questions, along with those about how and what we know about how young children learn from museum experiences, provide the structure for the report of findings. The review includes research reports appearing in peer reviewed publications from 2000 to the present. Though there is a vast research literature on the ways children learn during their early years, this review only considers research conducted in a museum setting or in other locations using learning resources and materials designed by museums.

The literature search revealed that most of the writing about young children in museums take the form of descriptions of programs, tips for working with young audiences and some evaluations of the effectiveness of program designs in attracting and engaging families with young children. Such program profiles and unpublished evaluations are outside of the scope of this review.

Key Issues Related to Museums and Early Learning

Are Traditional Museums Suitable Environments for Young Learners?

The foundational question about early learning in traditional museums is to ascertain if these environments are suitable for young learners. There are three aspects to this inquiry: 1) do traditional museums provide appropriate environments for fostering learning for very young children, 2) do children's interests and learning needs align with the subject matter found in traditional museums, and 3) what are children's and adults' beliefs and perceptions of museums as places that are welcoming and can benefit early development?

The United Nations Convention on the Rights of Children (CRC) proclaims that children should have free and full access to cultural life from birth. The committee's attention focused on children birth – 8, and it identified the need for activity and research about how to make these rights a reality. The authors argue that art museums, in particular, are ideal institutions for taking the lead to make the idea of child cultural citizens a reality (Mai & Gibson, 2011). McRainey & Russick (2010) and the authors in their anthology about connecting kids to history make a similar argument when they challenge adults in museums to work closely with children, to listen to them and to assume responsibility to create spaces in which children can connect to history.

A regional museums project in England, Renaissance North West, is based on the notion that museums provide key conditions for learning and that young children are interested in objects found in museums and can relate them to their lives. Access to objects, they contend, encourages active learning and prompts language development for thinking and communicating (Graham, 2008).

Research suggests that traditional museums provide an effective environment to encourage and support learning by young children. An investigation of museums from an educational psychology perspective (Paris, 1997; Paris & Hapgood, 2002) found that museums inherently foster intrinsic motivation to learn and the desire for sustained engagement with objects and content. Griffin (2004) quotes Paris' description of museums as environments that allow for key conditions for learning. They are places where people – including young children – "construct meaning, have genuine choices, encounter challenging tasks, take control over their own learning, collaborate with others, and feel positive about their efforts" (Paris, Yambor & Packard, 1998, 271).

Museums afford opportunities for learning that do not occur in other settings (Crowley & Jacobs, 2011). Access to real artifacts and specimens and to context-rich environments like dioramas and immersive exhibitions are a distinctive feature of traditional museums. Seeing extinct species and marveling at rocks, leaves and insects prompt children to say things like "we (humans) are not supposed to kill birds" and that "nature is amazing and precious" (Dockett, Main & Kelly, 2011). Bedford (2010) notes that museums like the Oklahoma City National Memorial and Noah's Ark at the Skirball Cultural Center in Los Angeles translate difficult adult topics like the Oklahoma bombing and the complexities of living in diverse communities into narratives that are appropriate for children and intergenerational audiences.

Young children's interests and the content of traditional museums

There is evidence that introduction to the disciplines of art, history and science at a very young age contributes to the development of a child's identity and builds a foundation for continued and increasingly more complex learning in school and in everyday life. Crowley & Jacobs (2011) assert that long before young children encounter science, history or social studies in grade school, they have developed a wealth of information through informal encounters with the topics. In their research they explore how parents mediate children's experiences to help weave multiple moments of learning into broader knowledge about academic disciples and foster the development of "islands of expertise."

An island of expertise is a topic in which a child happens to become interested and in which she or he develops relatively deep and rich knowledge. Crowley and Jacobs point out that typically, an island of expertise emerges over weeks, month, or years and is woven throughout multiple family activities that involve a theme of interest to the child like trains or dinosaurs. Their study of family learning found that parents use experiences

in museums to introduce their children to academic disciplines (Crowley & Jacobs, 2011).

The type of learning that leads to development of islands of expertise in young children has two distinctive features which are perfectly aligned with the kind of learning that takes place in museum settings. The learning is:

> collaborative: what is known was learned in social contexts and is co-constructed with parents; and
>
> opportunistic: learning is driven by what is noticed at any given moment by the child and adult.

Crowley & Jacobs's work builds on a line of early learning research conducted in the 1980s that supported the conclusion that the content and organization of children's knowledge played a much larger role in the development of memory in their later years than did age-related changes in developing capacity for working memory and speed of information processing. Children are interested in learning about content and are capable of understanding many concepts *at an early age*. Children ages 4 – 6, for instance, during hands-on learning experiences with globes and an instructional video, were introduced to the concept of sphericity of the earth and the phenomenon of day and night. Two weeks after the activities children used 3-D material models, the globe and their verbal explanations, and a high percentage of them remembered the concepts and activities that were part of the lesson (Kallery, 2011). The researchers concluded that hands-on, object-based approaches to learning are promising for helping children ages 4 – 6 develop their understanding of fundamental astronomical concepts and events often considered difficult for their age, and that knowledge of the topic at an early age could raise their motivation for lifelong interest in astronomy.

Beliefs and Perceptions of Traditional Museums as Places for Young Children

Research suggests that the image of traditional museums as too "adult" and off-putting for young children may be changing. In a study based on 2408 exit interviews with families at art museums and 1513 follow up interviews Luke, Figueredo & Ong (2011) report that parents of young children are, in fact, attracted to the art museum for its environment and content. For some, the availability of an interactive space specially designed for young children contributed to their perception that the art museum would be of interest to their young children (Adams & Moussouri, 2002). All adults reported coming to the art museum because they saw it as a place for a leisure, cultural and recreational outing.

Based on a three-year research project that closely followed young children's choices, behaviors and recollections of experiences in art, history and science museums, Piscitelli & Anderson (2001) present portions of transcripts of children talking about their museum experiences that clearly demonstrate that they had very positive experiences in the traditional museum settings and became interested in the museum. When the

exhibitions had objects and were about topics that the children could link to their pre-existing knowledge and experiences, they were among the most popular exhibits with the children.

Museum professionals are also becoming intrigued by the capacity of young children for learning. At the Australian Museum young children, with the assistance of their adult companions, created museum journals. The journals gathered together the photographs they took of favorite places in the museum, drawings, stories and recollections of what they learned. Taken together, the journals are "images of powerful and competent children actively making meaning out of their experiences and seeking to extend their understandings through access to physical, social, and cultural resources" (Dockett, Main & Kelly, 2011, 28). The journals were so convincing and exhibited such impressive levels of competence and sophistication among the young children, that there was a renewed interest among adults connected with the museum in this young audience of learners – an interest sparked by evidence that very young children in museums are engaged in important learning.

How Young Children Learn in Museums

Traditional museums are distinguished from other learning and recreational settings by the presence of real objects. Graham (2008) describes the process of object encounter for adults and children of all ages as including: 1) investigating; 2) communicating (talk about it); 3) representing (creative expression--draw, play game, sing); and 4) recalling (provides basis for later conversation). Though research findings are too scant to support conclusive statements, patterns are emerging from studies of young children in museums that present a picture of how they interact with the environments and what kinds of encounters with objects are most satisfying. Young children delight in being in the presence of "the real thing;" they are especially drawn to artifacts and specimens that are familiar to them from experiences at home, in their neighborhoods and in school. Young children make personal connections to what they see in the museum, and they respond especially well when stories and the use of their imaginations are part of the experience. Children value being part of authentic dialogues about what they are experiencing and what it means to them, and they appreciate humor.

The Attraction of the Real Thing

Young children often comment about how special it was to see the "real thing." When asked to talk about what they liked best, they often talked about places in the museum where they could see things up close, and if they could touch the objects and artifacts and have a multisensory interaction, the experience was even more memorable (Dockett, Main & Kelly, 2011; Graham, 2008; McRainey & Russick, 2010). Several researchers found that young children are especially drawn to objects that are large in scale and those that can be seen in context – where they are supposed to be (Anderson, Piscitelli, Weier & Taylor, 2002; Dockett, Main & Kelly, 2011). There is even some evidence that exhibitions with objects about topics familiar to young children have more

positive effects than exhibitions that are hands-on and multi-sensory (Piscitelli & Anderson, 2002).

Docket et. al. (2011) did, however, observe some interactions with specimens that were unsettling for young children. One little boy found the skeleton of a giraffe disturbing, and worried about where the skin was. He suggested that maybe the museum could have a picture of the giraffe with the skin on.

Familiar connections and contexts

What children attend to and remember from their museum experiences is highly correlated with the presence of familiar concepts or experiences, either contemporary or historic, with which the children could make strong links. "Such connections with common or familiar life experiences are vital links to children's enculturation and subsequent learning in museum environments" (Anderson, et al., 2002; Piscitelli & Anderson, 2002). Natural history and history museums are especially memorable for children. Animals, transportation vehicles, and dinosaurs, for instance, are readily known to children based on their interactions with their toys, picture and story books, and popular media. Such readily accessible connections are absent from many art museums and science centers and may suggest why these types of museums were often less frequently mentioned by young children when asked what they recall from visiting a variety of museums.

The role of familiarity in engaging young children reaches beyond familiarity with the content of the collections and exhibitions. Kinetic experiences with large-scale sculptures, for instance, are among young children's most memorable museum experiences. These experiences provided a highly familiar context – outdoor play. As a result, children know what to do and they enjoy the experience.

Personal & social connections

When a caring adult introduces a child to something that is special to the adult, the child associates the artifact with that adult, remembers it, and requests to revisit. (Dockett, Main & Kelly, 2011). In the Australian Museum a little girl was introduced to the owls by her grandmother, and even when her grandmother returned home after a visit, the girl would request to go and say "hello" to the owls whenever she was in the museum. The same researchers report children like seeing things with their favorite colors and artifacts that they already have some knowledge of from home or school.

The importance of story and imagination

The experience of hearing stories, either read from books, listened to on CDs or television, or told to them in person by adults, is a familiar and enjoyable part of young children's experiences. When stories are used in museum settings or when content is presented by a facilitator-led theater-based program, they are effective for young children

and described by them at great length (Anderson, Piscitelli, Weier, Everett & Taylor, 2002; Bedford, 2010; McRainey & Russick, 2010).

Bedford (2010) warns, however, about a too cavalier use of the word "story" in museum exhibits with titles like *The Story of Colonial New England*. She cautions against "didactic wolves dressed in storyteller sheeps' clothing."

> These may be stories; there are characters, a setting and action. But they are not real narratives. They do not take the visitor to another place in his mind; they do not engage her emotions or imagination . . . [for exhibitions] that means engaging all of the senses, including the somatic or physical, speaking to our emotions, using the specific to generate connections to the familiar and universal, and telling us something about some one(s) we are going to care about." (pp 113-114)

Young children often fashion their own stories (Dockett, Main & Kelly, 2011). Observers of children in the Australian Museum heard them imagining what it would be like if the animals came to life, and one little girl imagined mineral specimens as "fairy homes." The children elaborate on these imaginings, demonstrating that museum artifacts serve a valuable purpose of sparking and satisfying young children's imaginations.

Dialogue

Museum experiences that were frequently recalled by young children as among their favorites were ones when open-ended discussion was used to direct children to look closely at a work of art and contribute their thoughts about what they saw, how the elements where put together, and what meaning they ascribed to the piece (Anderson, Piscitelli, Weiner, Everett, & Taylor, 2002). The writing style and placement of labels greatly affect the time families with young children spend in an exhibition. It is not the amount of label copy, but the clarity of purpose and the writing style that make exhibitions more or less enticing for young visitors. Families spent an average of 7 minutes in a traditional exhibition at a history museum with sensational objects, labels with 4500 words and few interactives. At the same museum during the same period of time, families spent nearly 22 minutes on average in an exhibition that invited conversation and interaction with 1500 words of text (Rand, 2010).

Purposes for labels that foster engagement for young children include ones that invite, personalize, focus attention, describe action, narrate, anticipate and answer questions, explain what's going on, persuade, instruct, and encourage conversation. Exhibitions that hold families' attention longer have labels that are written in a voice that talks to the children through the parents, are written to be read aloud, and ask questions (Rand, 2010).

Humor

Children's recollections of memorable museum experiences suggest that they notice and appreciate the use of humor. Several weeks after a visit to a natural history museum,

children still recalled seeing the dinosaur with the pearls (Anderson, Piscitelli, Weier, Everett & Taylor, 2002). The necklace had been placed on the dinosaur because the museum was promoting and upcoming exhibition about pearls. The children took notice and missed the pearls on their return visit. The incongruity of a skeleton "rocking" in a chair also struck them as funny and very memorable.

What Young Children Learn in Museums

In October 2011 the Arts Council of England (ACE) assumed new responsibilities for national strategy for museums and libraries. In preparation, the agency undertook a range of activities to understand the needs and priorities of the sectors. One project was a review of the key research and literature about the activities and impact of museums and libraries. Three chapters of that report are germane to this analysis – a chapter about museums and children, a chapter on measuring and proving impact, and a chapter about improving the evidence base to support claims about the public value of museums.

The ACE report concludes that there is not sufficient evidence to support claims about advances in learning based on time spent in museums. "The evidence so far," the report proclaims, "is insufficient for drawing a clear conclusion" (Arts Council of England, 2011, 35). The review of available literature for this report on museums and young children supports a similar conclusion. The lack of robust evidence is due partly to the fact that studies tend to look at the perceptions of adults rather than actual evidence of children's learning. Researchers, museum staff, parents, caregivers and teachers are asked if they thought the visit did – or would - result in learning outcomes, rather than whether it actually did.

Lack of compelling evidence about learning might also be attributed to a culture of advocating for program support and increasing enrollment rather than a culture driven by a desire to advance knowledge about how and what young children learn in museum settings. Systematic program evaluations, like the one contracted by the Smithsonian Early Enrichment Center (SEEC) provide valuable information for program planners. In an unpublished report, the SEEC *Little Scholars* study documents children's achievement in content areas related to grade-level norms. Children in the museum-based program performed at or above grade level in all areas. The recent unpublished evaluation report based on the pre-school hands-on science program at the California Science Center represents state-of-the-art museum evaluation practices. The study examines the fidelity of implementation of the program design. It also includes information about teachers' and parents' perceptions of changes in attitude and advances in learning.

Published research studies about early learning in museums are not the norm; evaluation studies prepared for funders and other stakeholders are far more frequent, and they tend to reside in the files of individual museums and their supporters. They are not designed nor disseminated in ways that contribute to a growing body of rigorously analyzed data that can support claims of change, outcomes and impact. It was outside the scope of this

literature review to survey what are likely to be hundreds of evaluation reports scattered in museums across the country.

As might be expected given the relatively recent surge in programming for young children in United States museums, the research findings reported in earlier sections of this review come from exploratory, and often ethnographic, studies of children's behaviors in museum settings. The statements of purpose for the studies explicitly or implicitly recognize that museums are places for social, emotional and cognitive development. The types of behaviors that characterize children's behavior in museums are arguably the types of behavior that novices and professionals would readily characterize as learning behaviors.

To date, researchers find that children have detailed recollections of their museum experiences, remembering specific objects and artifacts as well as concepts. The exhibitions and other learning spaces in museums elicit exploration and inspire children to practice a wide range of developmental skills. Therefore, in lieu of presenting evidence of learning outcomes, this section of the review of literature presents an overview of the types of learning experiences that have been observed in museum settings.

Recollections Are Idiosyncratic

One approach to investigating what children learn from a museum experience is to talk with them about what they recall about the experience. "Perhaps the most striking aspect of children's self-report about their museum experiences was the diverse, highly individualistic, and idiosyncratic nature of each child's recollections, interests, and learning" (Anderson, et al., 2002). When asked what they remembered and what they liked best, children's responses ranged from "I liked getting on the bus and going to the museum," to "I liked the army tank . . . 'cause it had all that thing on it." and "I liked watching how they moved the dinosaurs to the new museum" [based on viewing a video at the museum]. The photographs that were taken of each child in front of his/her favorite exhibit among all of the things they had seen over three visits were also notable for their diversity. The authors conclude that the variety of stimuli encountered during museum experiences allow children to learn by constructing their own meanings based on prior knowledge and interests.

Though the content of individual recollections and choices of favorite exhibits were highly diverse (i.e., tanks, dinosaurs, giraffes, whales, giant magnet), large-scale exhibits and large artifacts were among the most frequently recalled.

Learning Activities Related to Scientific Literacy and Inquiry Skills

Most of the studies that examined young children's learning focus on the degree to which they practiced scientific inquiry. Observing and coding the type of learning behavior that a child exhibits while doing an activity is one way that researchers document learning. A rubric used in such a study (Puchner, 2001) recorded instances of the frequency of learning across a continuum of cognitive complexity. The levels of complexity, ranging from low to high are as follows:

- Simple cause and effect
  Child learns the physical relationship between an action and a result. Evidence that the child has noticed the effect or result must exist.

- Small motor
  Child develops or uses small-motor skills.

- Information - Script
  Child learns about the sequence of actions or the objects used during an event such as grocery shopping or cooking. Child learns a piece of information; asks question and answer is provided, or the adult provides information with clear evidence that the child attends to it.

- Information - Categories
  Child learns about classes or groups to which items or concepts belong.

- Information-Factual
  Child learns information that is related to neither script nor categories.

- Procedure
  Child learns the particular way of accomplishing something or of acting.

- Conceptual cause and effect
  Child learns or gains an understanding of the conceptual nature of a cause and effect relationship, or of the relationship between items or actions in a script or in a procedure.

To be coded as learning, one of four different types of events had to occur: 1) initial errors or difficulty solving a problem, followed by feedback, followed by fewer errors or solving the problem or a similar one correctly; 2) verbal feedback from an adult followed by a corresponding change in behavior; 3) child asking a question and receiving and attending to a response; and 4) child acting on the environment and obtaining and attending to a causal effect.

Children in the exhibition showed behaviors reflective of all levels of learning, though examples of relatively higher levels of cognitive complexity were observed more rarely than examples of learning of lower complexity. Both the amount of adult interaction and the design qualities of the exhibition affected the levels of learning complexity. With more adult interaction, children showed learning levels of higher cognitive complexity, and exhibitions where it was clear to adults what an adult should and can do invited more adult interaction and scaffolding.

In another study (Van Schijnel, Franse & Raijmakers, 2010), researchers developed the Exploratory Behavior Scale (EBS) as a method for assessing the quality of children's explorations in different museum settings. They reasoned that manipulation, sustained attention, and repetition with variation that has a child performing different actions with the same object or performing the same action with different objects comprise high levels of exploratory behavior. Such high levels of exploration were considered indicators of scientific reasoning in action. Their research involved children ages 4 and 5 and compared levels of children's exploratory behavior when trained researchers used three types of

coaching. They found the highest levels of exploratory behavior among children when the adults asked open questions and directed children's attention to specific aspects of the exhibition. In a second study they found that when parents were shown a video about how to stimulate children's exploration, children with parents who had seen the video showed more exploratory behavior.

Learning Activities Related to Art and Meaning Making

"Letting children take the lead as guides who direct their own experience in the art museum shows them they have a valuable contribution to make and allows them to learn actively *from* the artworks (through inquiry) rather than passively *about* them (through listening to 'facts' or fixed meanings) . . . [art museum experiences] support children to explore art and connect with it from their own experience and knowledge base. This kind of interaction leads to true understanding and appreciation of art" (Weier, 2004, 115).

Weiner (2004) and Trimis & Savva (2007) catalogued instances of inquiry and meaning-making when they observed young children in art museums. The experience of expressing their own views and hearing the views of others gave the children a sense of "the infinite nature of context" and opened them to understanding that there never is a fixed perspective, but rather multiple perspectives. As is often the case in art museum programs, and sometimes the practice in natural history, science and history museums, after looking in the galleries, the children made works of art in a studio-like setting.

The Studio Thinking Framework was developed at Harvard and Project Zero based on research that observed and coded over 103 hours of learning in school art classes in an effort to answer the question: what is being learned when students make art? Data included videotape recordings, audio recordings, researcher field notes and photographs of student work. Based on careful coding and analysis, eight categories of learning were identified (Hetland, Winner, Veenema & Sheridan, 2007), and they are as follows:

- Learning development of craft
- Learning to engage & persist
- Learning to envision
- Learning to express
- Learning to observe
- Learning to reflect
- Learning to stretch & explore
- Learning to understand the artist's world view

Hetland's work is consistent with the beliefs of Dewey and the many others who employ a constructivist theory to explain how and what children learn. Sheridan (2010) in her article in Narey's (2007) volume about the importance of making meaning, demonstrates that the habits of mind associated with studio work that Hetland identified among school-aged children also are present when very young children make art.

Whether noticing certain parts of exhibitions, examining objects carefully, telling a story, creating a work of art or experimenting with magnetic fields, the type and amount of learning that children do in museum settings are highly influenced by the interactions the children do or do not have with the adults who are with them.

The Role of Adults in Young Children's Learning

Perhaps influenced by the popular success of children's museums and often-selected child-centered activities like play groups and trips to the playground, many adults view play, not learning, as the best activity for very young children. It is outside the scope of this review to address in any depth the relationship between play and learning for young children. But the ways that adults interact with children in child-centered activities is pertinent to a discussion of the role for adults in young children's learning in traditional museums. There are cultural differences associated with the place of play and learning in young children's lives (Bernstein,et. al., 2005; Gaskin, 2008; Parmar, Harkness & Super, 2004). There are also individual and cultural differences in how adults participate in children's play and learning.

Research shows that in children's museums much adult behavior is more hands-off than hands-on. In a recent study, only about one-third of the adults were observed playing with their children during visits, though more than one-third of the adults reported being interactively engaged (Downey, Krantz & Skidmore, 2010). The tendency in such settings is for adults to allow the children to play while the adults provide supervision and discipline. A smaller number provide instruction by reading information to the children and helping them name things, or by guiding their investigations (Crowley & Jacobs, 2011; Downey, Krantz & Skidmore, 2010; Wolf & Wood, 2012).

Adults play an undeniably important role in guiding young children's learning. Parents and other adults provide spontaneous, casual explanations in response to questions from children and in so doing help shape what children know. Studies that catalogue the types of interactions that take place during a day between young children and their parents report that casual explanations in response to questions about what is encountered in the world account for: 32% of adult interaction with 3 year olds; 61% with 4 year olds; and 54% with 5 year olds (Crowley & Jacobs, 2011).

The kind of explanation that occurs within the context of everyday family life is different from the kinds of explanations that might be encountered in on-going classroom or workplace settings. The fragments of explanations that characterize family interactions are called "explanatoids" (Crowley & Galco, 2001). They tend to be brief, incomplete and specifically targeted to a moment of authentic collaborative adult-child activity and thus provide children with immediate assistance in parsing, storing, and making meaning based on evidence as it is encountered. It is the cumulative effect of these brief, casual interactions that results in young children developing islands of expertise.

Although children and adults may spend many hours during everyday life reading about things, noticing them in pictures or on clothing, and playing with toys and replicas, it is only in the museum that they can attach their knowledge to the authentic object. Crowley & Jacobs (2011) assert that precisely because visits to museums are special occasions and not a part of everyday life, they become highly memorable for both children and adults, and they provide particularly powerful experiences upon which further learning can be built.

Negotiating Agendas

Very young children do not visit museums alone. They are always in the company of at least one adult, and the adult for the most part, determines where the child will go while in the museum. So, from the outset, the voluntary, free-choice nature of positive museum experiences for adults are only available to young children if the adult allows the child to take the lead at some points during the visit. Adults play a major role in what and how children experience a museum.

The problem with adult-centered agendas for young children in museums is that young children have missions and agendas of their own, and those agendas may not be consistent with the missions and agendas of their guiding adults. Anderson, Piscitelli & Everett (2008) observed adults and children during their museum visits and based on analysis of these interactions identified three types of competing agendas.

- *The Agenda of Content*: A child may be interested in the content of a painting (e.g., volcano, dogs), while the adult may try to focus attention on the elements of art.

- *The Agenda of Mission*: A child may wish to find a particular exhibit or favorite object (e.g., trains, dinosaurs) while the adult persists in having them survey the entire museum.

- *The Agenda of Time*: The amount of time that a child or adult may wish to spend with a particular artifact or gallery may vary greatly.

The study that chronicled these competing agendas focused on young children's visits to museums with a school group. While there is a greater tendency for parents to plan child-centered visits, especially when visiting natural history museums and interactive galleries, it is easy to imagine similar agenda "conflicts" when children are in the museum with parents, grandparents and caregivers on family outings and when museum planners design exhibits and experiences. There is a need for all adults (parents, caregivers, teachers and museum staff) to listen to the voices of children. For adults, controlling the museum experience is in many ways easier than negotiating the experience. However, a sensitively determined, negotiated path that allows children some choice results in a higher quality overall experience and more rewarding learning outcomes for children (Anderson, Piscitelli & Everett, 2008; Dockett, Main & Kelly, 2011).

Collaborative Learning

Museum visits for young children, at their best, are negotiated, collaborative experiences. Wolf & Wood (2012) observe that a "movement away from child-centered experiences and toward family-centered experiences has slowly permeated the collective attention of leaders in children's museums." They also note that lessons learned from the work done in children's museums can provide models for those in other museum settings to meet the needs of early learners.

The most exhaustive research about how families interact in museums has focused on their conversations, talk and verbal interactions (Crowley & Galco, 2001; Puchner, Rapoport & Gaskins, 2001). Noting that very young children are not necessarily highly verbal and also attentive to the personal and cultural differences in modes of interaction between adults and children, Beaumont (2010) reports on the process of developing the Adult Child Interaction Inventory (ACII) [2]. She identifies six roles played by adults when interacting with children in a hands-on science exhibition: player; facilitator; supervisor; interpreter; student; and co-learner. Nearly all of the adults (93%) facilitated the children's learning. Many also provided supervision (77%) and played along with the child (79%). Very few (13%) engaged with the exhibition and the child as co-learners.

Several factors contribute to the nature of the interaction between children and adults. If the adult perceives that the exhibit is designed for more independent child exploration such as in interactive spaces like discovery rooms and hands-on art areas, then children initiate the choice of a particular activity and they play on their own with the adult available nearby (Adams, 2011; McRainey & Ruskin, 2011). In traditional museum exhibitions and galleries, and in parts of an interactive space that are perceived by the adult as more challenging, the adult initiates choices, interacts more directly with the child, and provides more guidance (Adams, 2011; Beaumont, 2010).

Swartz & Crowley (2004) observed that parents' beliefs about teaching and learning and their familiarity with the museum influenced the ways they interacted with their children in a hands-on exhibition. Adults who were less familiar with the museum or believe that learning is deeper when it is self-constructed through discovery and inquiry (a constructivist model) held back and let the child go into the exhibit, offering help if the child got stuck. Those who were more familiar with the museum or who held a belief that learning is accomplished through participation in social and cultural settings (a sociocultural model) were more likely to learn together with the child and to use explanations to connect the exhibit experience to the larger world. They were also more likely to follow up with related activities at home.

Others call attention to cultural norms and beliefs and how they affect the ways adults contribute to children's learning. Based on ratings of 683 preschoolers ages 3-6 interacting

[2] The Adult Child Interaction Inventory (ACII) was developed as part of a research –to- practice collaboration between the Boston Children's Museum and Evergreene Research and Evaluation as part of an NSF-funded project – Preschoolers, Parents, and Educators: Strategies to Support Early Science Literacy (PPE) – led by Boston Children's Museum.

with their caregivers, Bernstein and his colleagues (2005) concluded that different aspects of parent-child relationships are salient and important for child development in different cultural settings: 1) affective responsiveness and closeness for Latin-American dyads; 2) compliance and parental control for African-American dyads; 3) parental discipline and teaching for Chinese dyads; and 4) no clear consistent picture emerged for Anglo-American dyads. In another study, two contrasting patterns of beliefs and practices about early childhood development emerged. Euro-American parents believed play to be an important vehicle for the early development and growth of the preschool children. They considered play helpful for all aspects of development, and they readily engaged in play with their children. In contrast, the Asian parents did not value play for the development of preschool children. They did not believe play helps children get ready for school. The Asian parents stressed the idea that getting a head start in early academics is important for the cognitive development of children in the preschool years, and they tended to spend time with their children introducing and explaining ideas and resources related to academics (Parmar, Harkness & Super 2004). The authors conclude that in designing learning experiences for children, it is essential that planners understand the cultural nature of their own beliefs about early development, as well as those of children's parents and caregivers, and strive to resolve them in ways beneficial to the child.

Adult Guidance

Adults in museums support learning by teaching young children to observe, imitate and repeat actions and words. The verbal and nonverbal guidance provided by adults is called scaffolding (Wolf & Wood, 2012). A collaborative study by Harvard's Project Zero and Please Touch Museum in Philadelphia based on 101 open-ended observations of children's learning in a museum setting concluded that "adult supportive interaction in the form of developmentally appropriate, open-ended questions is critical to a child's learning within the museum context" (Haas, 1997, 67). Adults also share basic information; interact with artifacts in basic ways; use artifacts to explore topics in more depth; and work together with children to collaborate and solve problems, researchers have found evidence of more behaviors indicative of learning at higher levels of cognitive complexity for children who interacted with adults in these ways (Puchner, Rapoport & Gaskins, 2001; Van Schijndel, Franse & Raijmakers, 2010).

Some types of coaching and guidance result in more learning than others. Controlling or minimal interaction that simply encourages children to continue playing and instances where adults explain principles or causal connections to children result in less exploratory behavior than does scaffolding interaction that encourages exploration by asking questions and by directing attention to specific aspects of the exhibits (Van Schijndel, Franse & Raijmaker, 2010)

A counterargument to the conclusion that the best museum experiences are collaborations between children and adults is presented by the developers of the award-winning *Sensing Chicago* exhibition at the Chicago History Museum. They claim that "[w]hile docents, gallery facilitators, teachers, parents, and caregivers play important roles in navigating children's visits to museums, we have focused on unfacilitated exhibitions to

show that museums can create experiences in which kids have meaningful encounters with history that invite them to take the lead, make choices, and be engaged" (McRainey & Russick, 2010, 18). One could argue, however, that the experiences of the children in the space, while not facilitated in real time, do benefit immensely from the time and attention the planning team gave to understanding the needs of children and consciously designing the space to guide their exploration.

Research about museums and early learning provides many accounts of what researchers are convinced are learning experiences that support the social, cognitive and emotional development of young children. These personal, and often systematic, observations of the positive qualities of museum experiences are contributing to a surge in the numbers of museums who are offering early childhood programs and the numbers of families who are attracted to them. Yet, rigorous research studies about early childhood development overwhelmingly focus on learning in daycare settings, schools and homes, and do not include museum settings.

The Role of Museums in Support of Early Childhood Development

Young children are spending increasingly more time in museums, but there is still little research about how these experiences contribute to their social and cognitive development (Nolan & Robinson, 2012; Paris & Hapsgood, 2002). Most of the programming for young learners take the form of occasional learning opportunities through workshops, Family Days, hands-on kits, classes and interactive galleries specially designed with children and families in mind. As such they are often classified within the domain of informal learning and not given the same attention as formal learning in Head Start programs and preschools. Yet, research in early childhood education shows that the combination of formal and informal learning experiences is the most effective (Stocklmayer, Rennie & Gilbert, 2010).

As reported earlier, investigations of young children's learning in museums are focused on the nature of the learning experience, the studies do not reference early learning standards (Bowman, 2006), indicators of school readiness (Bowman & Moore, 2006) nor assessment tools based on early childhood development standards like the Early Learning Scale developed by the National Institute for Early Education Research (Riley-Ayer, Frede, Jacobs & Boyd, 2008) or assessment tools for preschool science learning (Brenneman, 2011). The standards and assessment tools document children's progress in achievements in science (content & process), math, social studies, language arts literacy, creative arts, social emotional development, health, safety and physical education. The studies that report evidence of improvement (learning) and lasting effects of various types of preschool learning environments do not take place in museum settings (Barrett, 2008, Brenneman, 2011).

The presence of museum-based preschools in the United States is a little known phenomenon. Since the first museum school opened in 1949 at the Fort Worth Museum of Science and History, thousands of children have had the experience of learning in the object-rich, hands-on and exploratory settings that museums provide. Today the largest museum

preschool in the country, the Smithsonian Early Enrichment Center (SEEC), is housed in two Smithsonian museums on the mall in Washington, DC. Other preschools in operation across the country include: the SciTech Discovery Preschool in Aurora, Illinois; the Science School at the Museum of Nature and Science in Dallas; the Preschool at the Boonshoft Museum in Dayton, Ohio, the deCordova Sculpture Park & Museum in Lincoln, Massachusetts, and two preschools in Rochester, New York – the Woodbury Preschool at the National Play Museum and the Rochester Museum & Science Center Preschool.

The increasingly high number of museum programs provided for very young children and their families and the contributions that some museums are making to the formal education system with in-house preschools and development of materials for use in preschool classrooms represents both a commitment to allocate resources to early childhood development and expectations that the investments have a positive impact.

The very different types of measures used to assess the quality of museum experiences and early childhood learning experiences that take place at home and in school, suggest that the cultural, policy and academic communities that share an interest in the positive development of all young children have not yet joined forces. This literature review did not produce any evidence of collaboration or strategic initiatives to maximize the understanding of the role of museums in the lives of young children. Work about museum learning is taking place in the narrow domains of museum education, informal learning and visitor studies. Research that advances knowledge and informs public policy about early childhood development is taking place in schools and homes.

Conclusion

Toward a Collaborative Research Agenda

There is speculation – though no critical mass of evidence – that the experiences young children have in museums may shape their thinking, values, aspirations, artistic appreciation, understanding of science, and identities throughout their lives. A new area of early childhood research that examines the impact of museum-based learning on the development of young children would have the dual benefits of understanding children's development and promoting their learning in new settings (Paris & Hapsgood, 2002) by adding museums to the traditional research settings of home and school. Such research can also advance understanding of the singular and collective contributions these three settings make to the holistic development of young children.

The ambitious study undertaken in Australia[3] in the late 1990s (Piscitelli & Anderson, 2000), offers a model for research partnerships between academia, museums and

[3] A multi-faceted investigation of young children's interactive and informal learning in museums is cited often in this review. The research project was undertaken by the Queensland University of Technology Museums Collaborative (QUTMC). It was a three-year research project funded by the Australian Research Council, museum partners, and the

national policy agencies. As the Arts Council of England concluded last year, there is opportunity not only in England, but also in the United States to put in place shared measures for data collection that focus on a small set of shared indicators of success (Arts Council of England, Renaissance Review Advisory Group, 2009).

There is a wealth of information about innovative, reliable, respectful and age-appropriate ways to gather information about the experiences and learning of even the youngest children (Beaumont, 2010; Crowley & Jacobs, 2011; Dockett, Main & Kelly, 2011; Greig & Taylor, 2007; Haas, 1997; and Sheridan, 2007). The challenge is to introduce museum, early childhood and public policy professionals to each other so that they can: 1) recognize their shared goals; 2) understand the resources and learning environments available in museums that can benefit young children; 3) join forces to articulate indicators of success and 4) conduct rigorous research studies to advance knowledge and produce evidence of the immediate and lifelong value of museum learning for our youngest children.

The editor of the issue of the *Journal of Museum Education* about museums and early learning published in Spring 2012 provides a call to action. "As a society we have a responsibility to ensure that our youngest children are engaged in quality learning experiences; and museums, as important community institutions, will need to seek opportunities and contribute in new ways to this critical effort . . . [museums] have an important role to play in shaping the learning of this young generation [and] joining forces with educators and policy makers from across the community to meet early learning goals" (Shaffer, 2012).

QUT. The QUT museums collaborative was made up of staff from Queensland University of Technology (QUT), the Queensland Art Gallery (art museum), the Queensland Museum (natural and social history museum), the Queensland Sciencentre (interactive science and technology centre) and Global Arts Link (visual arts and social history museum).

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