The Learning Value of Children's Museums:
Building a Field-Wide Research Agenda

A Landscape Review

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Introduction

  Children's museums represent one of the fastest growing segments of the museum community; however, the evidence base to demonstrate the learning value of these institutions has not kept pace. With funding from the Institute of Museums and Library Services (IMLS), the Association of Children's Museums (ACM) and the University of Washington's Museology Graduate Program (UW Museology) are partnering to generate a field-wide research agenda for children's museums, an agenda that will identify and prioritize the most pressing evidence needed by the field to articulate and demonstrate the distinct learning impacts of children's museums.

  On September 10 and 11, 2013, ACM and UW Museology will bring together practitioners, researchers, and policy-makers in Arlington, VA for a two-day symposium to collaboratively draft a field-wide research agenda for children's museums. To set the stage for research agenda building efforts at the symposium, UW Museology prepared this landscape review of children's museums' understanding of learning value as evidenced by current research and evaluation efforts. The review of evidence was necessarily limited by the scope of the project, and as such is not intended to be exhaustive but rather is intended to provide a snapshot of the current research landscape of the field. This landscape review addresses three complementary questions, reviewing three different data sets that speak to the learning value of children's museums:

  1) What impacts do children's museum professional aspire to have on their

    constituencies?

  2) What evidence exists in the literature about the learning value of children's

    museums?

3) What evidence do children's museum professionals want in support of the learning value of their institutions?

1) What impacts do children's museum professionals aspire to have on their constituencies?

Overview

In Spring 2013, UW Museology surveyed children's museum professionals within the ACM membership. The goal of the survey was to conduct a field-wide scan of the ways in which children's museums professionals aspire to impact their audiences, and to identify some of the specific impacts that children's museum professionals believe they have on their audiences. As such, the field-wide scan provides a unique perspective on the learning value of children's museums—it does not offer evidence of their impact, but rather offers perceptions and intuitions from the people who work in these institutions, documenting the difference they hope that children's museums make within their communities.

Methods

A web-based questionnaire was emailed directly to the Executive Director/CEO at each of ACM's 280 open museum members as well as each of the 55 corporate ACM members. In addition, announcements of the survey were placed in ACM's monthly electronic newsletter (which reaches 2,295 individual ACM members). Member museums were instructed to ask two staff members from their institution—ideally the Executive Director/CEO plus a programmatic staff member (e.g., Director of Education, Director of Research and Evaluation, Director of Exhibits)—to complete the survey.

A total of 106 children's museums professionals responded to the questionnaire. Approximately half held the title of President/CEO/Director (n=52, 54%); almost one quarter

were Directors of Education (n=21, 22%); another 10% (n=10) were either Director of Exhibits or Director of Research & Evaluation; and the remainder (n=12, 13%) held some other title within the museum. The majority of respondents were from urban children's museums (n=67, 68%), with smaller numbers from suburban (n=26, 27%) and rural (n=5, 5%) locations.

<u>Findings</u>

A) How distinct are the impacts of children's museums from other museums?

We asked children's museum professionals "In your mind, how distinct are the impacts of children's museums as compared to other museums?" Responses to the question were scaled (1–7 with 1 meaning "entirely the same" and 7 meaning "completely distinct"). The median response was 6, suggesting that most felt that the impacts of children's museums are in fact unique.

Respondents were also asked to explain their rating. Three major themes emerged from the coding of these comments about the unique impacts of children's museums:

- 64 comments referenced the nature of the learning experience, emphasizing that it was this experience that made the impact of children's museums unique;

- 37 comments referenced the learning outcomes that result from a visit to a children's museum, emphasizing that it was these outcomes that made the impact of children's museums unique; and

- 24 comments referred to the target audience of children's museums, emphasizing that it was the audience that made the impact of children's museums unique.

Table 1 shows the range of comments that referred specifically to the nature of the learning experience in children's museums. The majority of comments in this category

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emphasized the interactive, hands-on and play-based nature of the learning experience when highlighting what makes children's museums unique.

Table 1: "Learning experience" as unique aspect of children's museums.

Learning Experience	N
Interactive/hands-on	23
Learning through play	10
Interdisciplinary	6
Variety of learning styles	5
Less focus on collections	4
Experiential	3
Facilitating discovery	3
First museum experience	2
Learn by doing	2
Nonlinear	1
Visitor-centered design	1
Free choice	1
Lifelong Learning	1
Creating comfortable learning environments	1
Inquiry-based learning	1
Focus on intergenerational learning	1

Table 2 shows the range of comments from respondents who emphasized the unique learning aspects of children's museums. The majority of these comments emphasized the perception that children's museums focus less on content learning than do other museums, and they focus more on social/emotional growth and on the development of the whole child.

Table 2: Learning outcomes as the unique aspect of children's museums.

Unique Outcomes of Children's Museums	N
Less of a focus on content learning	15
More of a focus on social/emotional growth	7
More of a focus on whole child development	6
Focus is more on setting the stage for learning	4
Critical thinking/problem-solving skills	1
Focus on lifelong learning	1
How things work	1
More of a focus on development of skills/attitudes	1

Finally, Table 3 shows the range of comments that questionnaire respondents made about the target audience of children's museums. These data suggest that professionals who emphasized audience as a unique aspect of the impact of children's museums were predominantly referring to the specific focus on either children and/or families.

Table 3: "Target audience" as the unique aspect of children's museums.

Unique Audience Impact of Children's Museums	N
Focus is on children/families	19
Repeat visitation builds deeper relationships	3
Focus is on learners of all ages	2

B) What impacts should children's museums ideally have on their publics?

Children's museum professionals were asked, "How important is it that children's museums achieve each of these types of outcomes: cognitive learning, emotional growth, social development, skill development, and attitude change?" This list of outcomes was informed by the National Science Foundation's evaluation framework (Friedman, 2008). Respondents were asked to rate the importance of each on a scale from 1–7 (1=not at all important and 7=extremely important). The respondents' ratings indicated that all five outcomes are highly important for children's museums to achieve (see Table 4). Social development was rated slightly higher than the other outcomes (median=6.5), which confirms data reported above suggesting that children's museum professionals perceive their institutions are unique in their emphasis on children's social growth.

Table 4: Professionals' ratings of the importance of children's museum outcomes; scale of 1–7, where 1=not at all important and 7=extremely important (N=106).

Importance	1	2	3	4	5	6	7	Median	N
Cognitive learning	1	2	1	11	18	28	45	6	106
Emotional growth	1	2	1	4	21	33	44	6	106
Social development	1	0	0	3	11	38	53	6.5	106
Skill development/refinement	1	1	2	14	27	30	31	6	106
Attitude change	1	3	3	11	24	29	34	6	105

We hypothesized that questionnaire respondents might tell us that all five outcomes were highly important, so we also asked them to rank these same five outcomes in order of importance. Table 5 shows the ranking results. The weighted means indicate that social development is again seen as most important to children's museum professionals; they also suggest that skill development/refinement and attitude change may be seen as less important.

Table 5: Professionals' ranking of the importance of children's museum outcomes (N=106).

Impact Importance Rank	First	Second	Third	Fourth	Fifth	Weighted Mean
Cognitive learning	37	20	21	16	11	**3.53**
Emotional growth	12	30	21	30	12	**3.00**
Social development	31	32	24	14	4	**3.69**
Skill development/refinement	7	15	29	27	26	**2.52**
Attitude change	19	6	14	17	48	**2.34**

C) What kinds of research and evaluation are children's museums currently engaged in?
To gauge how many children's museums are doing various kinds of research and evaluation respondents were asked, "Which of the following has your museum engaged in within the last 12 months?" Answer choices included internal evaluation of exhibits or programs; third-party evaluation of exhibits or programs; internal research on learning in your museum; external research on learning in your museum; and marketing research. Table 6 shows the distribution of responses, and suggests that almost all museums in the sample have

done an internal evaluation in the last year; two-thirds have engaged in marketing research; and almost a half were/are engaged in learning research.

Table 6: Percentage of respondents whose institution is engaged in research and evaluation (N=106).

Evaluation Activity Within Last 12 Months	N Museums	Percent
Internal evaluation of exhibits or programs	91	94%
Third-party evaluation of exhibits or programs	58	60%
Internal research on learning in your museum	46	47%
External research on learning in your museum	39	40%
Marketing research	62	64%

To determine the prevalence of using evaluation and marketing research to guide exhibit and program development in the museum, children's museum professionals were asked, "Do you use evaluation to guide exhibit or program development at your museum?" and "Do you use marketing research to guide exhibit or program development at your museum?" Responses are shown in Table 7, and indicated that almost two-thirds of respondents work in children's museums that use evaluation and/or marketing research to inform practice.

Table 7: Percentage of respondents who use evaluation and marketing research to guide practice in their institution (N=106).

Using Evaluation and Marketing Research for Design	Yes	No	% Using
Use Evaluation	87	11	89%
Use Marketing Research	60	36	63%

2) What evidence exists in the literature about the learning value of children's museums?

Overview

In the Spring of 2013, we conducted a focused review of the literature in order to synthesize what research says (and doesn't say) about the learning value of children's museums. To our knowledge, no such review has been done to date. Munley (2012) reviewed research on young children in museums for the Smithsonian's Early Enrichment Center (SEEC), but looked at museums broadly, not children's museums specifically. White (2013) summarized the types of play, and their benefits for children's development, but does not document play and learning as it happens in the unique environment of a children's museum. Shaffer (2012) guest edited a special issue of the *Journal of Museum Education* focused on early learning in museums, but, again, the emphasis was on museums broadly and with a particular focus on programs.

The questions that guided this literature review are focused not on the learner (i.e., young children in museums) but rather the learning context (i.e., children's museums), and of course the learning that takes place in that context. This focus on the learning context sets the stage for national conversations about the learning value of children's museums and will help us begin to articulate what is still unknown about the impacts of these institutions. Specifically, the following questions guided this literature review:

a) What is the nature of research conducted in children's museums?

b) What methods are used in studies conducted in children's museums?

c) What does the research tell us about the how and what people learn in children's museums?

<u>Methods</u>

A total of 75 articles/reports were reviewed. Two criteria were used to identify and select these studies. First, we targeted only empirical studies. However, the search was not limited to published work only, but included unpublished studies as well in order to capture the full range of investigatory efforts in children's museums. Targeting only empirical studies necessarily excluded many articles that focused on best practices in children's museums, describing a particular program or exhibit or offering tips on programming for children and/or families. These were deemed outside the scope of a review of research. Second, the studies reviewed focused solely on research in children's museums. This concentration excludes research in other museums, and in particular "children's museum-like" settings in other museums such as interactive family galleries in art museums. The primary interest was in the learning that happens in and from children's museums, given that the project is designed to build a research agenda for those institutions specifically.

Studies were located through multiple sources including a) academic databases such as ERIC and PsycINFO; b) field-specific databases such as InformalScience.org; c) an announcement in ACM's monthly electronic newsletter, sent to all ACM members; d) email solicitations sent by ACM and UW staff to professionals who were known to be involved in research and/or evaluation projects in children's museums; and e) follow-up emails sent to professionals who responded to the Spring 2013 survey, indicating that they had relevant studies to share.

<u>Findings</u>

A) What is the nature of research conducted in children's museums?

Articles/reports were coded according to their type: a) basic research study; b) evaluation study; 3) synthesis paper; or 4) position paper. Table 8 shows the majority of the studies conducted in children's museums appear to be evaluative in nature.

Table 8: Type of article/report (N=75).

Type	N
Evaluation study	45
Research study	22
Synthesis paper	7
Position paper	1

Of the evaluation studies, 43 of the 45 were summative in nature. Studies were evenly divided between exhibit evaluations and program evaluations. Examples include a summative evaluation of the *How People Make Things* exhibit at the Children's Museum Pittsburgh (Sanford, 2009) and a summative evaluation of a childhood obesity program designed by the Boston Children's Museum (Kuross & Folta, 1999).

Research studies included a mix of those focused on how and what people learn in children's museums and those using the children's museum as a context for conducting research focused in some other area. A good example of the latter is a study conducted by researchers at Columbia University, New York, NY and staff at the Children's Museum of Manhattan (Thompson, McCrink & Bushara, n.d.). These authors conclude their study by saying "…we have come to understand over our time observing that the museum provides a very rich fountain of information and there are undoubtedly more ways in which the field of psychology can benefit from this particular environment" (p. 24).

In addition to coding studies by their type, we coded for the specific context in which research or evaluation was conducted. We were interested in knowing if there were trends in terms of the children's museums in which studies are being done, as well as trends in terms of whether studies focused on an exhibit, program, or some other context. Table 9 shows institutional trends. (The 21 in "Other" represent institutions in which only one study in the sample was reviewed.)

Table 9: Children's museum in which studies were conducted (N=75).

Children's Museum	N
Boston	3
Chicago	4
Pittsburgh	4
Indianapolis	6
San Jose	7
Minneapolis	8
Houston	10
Not Specified	12
Other	21

Two trends are interesting to note. First, more than half (56%, n=42) of the studies in our sample were conducted in one of only seven museums. Second, Children's Museum of Houston, Minnesota Children's Museum, Children's Discovery Museum of San Jose, and The Children's Museum of Indianapolis are over-represented in our sample; these institutions sent multiple reports from their institutions.

Table 10 shows the more specific focus of the studies conducted in children's museums, and suggests this focus is evenly split among the institution as a whole (e.g., Downey, Krantz & Skidmore, 2010), one or more exhibits within the institution (e.g., Allen, 2007), and one or more programs designed by the institution (e.g., Children's Museum of Houston, 2013).

Table 10: Specific institutional context in which studies were conducted (N=72).

Context	N
Institution	20
Exhibit	34
Program	18

B) What methods are used in studies conducted in children's museums?

The large majority of studies conducted in children's museums are designed to be descriptive in nature (see Table 11). Descriptive studies seek to collect data about "what exists." For example, Wolf and Wood (2012) describe scaffolding behaviors observed in museum visitor groups at The Children's Museum of Indianapolis. Swartz and Crowley (2004) describe how parents see their role as a teacher in the Children's Museum Pittsburgh. Very few of the studies conducted in children's museums go beyond description to compare different situations or groups or to study the effects of manipulations in the learning environment.

Table 11: Design of the studies conducted in children's museums (N=75).

Design	N
Descriptive	61
Quasi-experimental	5
N/A	9

Also of interest to us were the methods researchers and evaluators use to study learning in and from children's museums. Table 12 shows the range of methods employed across the 75 studies we reviewed and suggests that the large majority of research in children's museums is based on surveys and interviews.

Table 12: Methods used in the studies conducted in children's museums (N=69[1]).

Method	N
Observation	28
Surveys	24
Interviews	21
Tracking	13
Assessment	3
Sorting Activity	3
Reflective Paper	1
Personal Meaning Mapping	2
Reflective Collage	1

Finally, samples in the studies were reviewed in an effort to understand from whom researchers and evaluators are collecting data from in children's museums (see Table 13). For the most part, samples were comprised of either children and/or adults; fewer of the studies sampled family groups.

Table 13: Samples in the studies conducted in children's museums (N=69).

Study Samples	N
Children	33
Adults	15
Families	12
Parents/Caregivers	9
Caregiver/Child Dyads	8
Museum Staff	7
Teachers	3
Focus Group	2
Librarians/Libraries	2

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[1] Many studies employed multiple methods and so the total does not add up to 69. The N is 69 because several studies did not report methods.

C) What does the research tell us about how and what people learn in children's museums?

At the core of this literature review was a focus on what the research says about the learning value of children's museums. What is known about how people learn in these settings? In what ways do children's museum experiences contribute to people's learning? What impacts have been documented, for children, families, and communities? Looking across the findings of the 75 studies in our sample, we coded their results into six emergent categories, all of which speak to how and what people learn in children's museums. Table 14 outlines these categories, and shows how many of the 75 studies fall within each category. Following the table is a detailed discussion of each set of findings.

Table 14: Categories of findings identified across the literature (N=75).

Category of Findings	N[2]
Visitor behaviors	27
Role of adults/caregivers	27
Learning outcomes	24
Institutional practices/values/beliefs	18
Visitor reactions	17
Learning strategies	13

1) Visitor Behaviors

Much of the research conducted in children's museums (36%) seeks to measure what visitors do in this setting—which exhibits they stop at, how much time they spend there, which aspects of the exhibits they engage with, and how they interact with each other during their visit (i.e., Randi Korn & Associates, 2007, 2008b, 2011b; Wolf & Wood, 2010; 2012). Perhaps this focus is to be expected given that the majority of the studies are evaluative in nature with a particular emphasis on visitors' interactions with specific activities within the museum.

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[2] Many articles were included in more than one category; thus, the total count does not add up to 75.

Results from these studies suggest that children's museum experiences can be quite

engaging for children and families and that much of the experience is social in nature, with

children and adults interacting frequently. At a specific level, results say less about what makes

children's museums engaging. Some studies point to the significance of stimulating

conversation and/or collaboration between parents and children (Ashton, 2011; Kessler, 2011;

Randi Korn & Associates, 2008b). Other studies point to the importance of physical, hands-on

play (Garibay, 2011; Sykes, n.d., Hunter College, 2013). Several studies point out that it is most

often children who are the drivers of the children's museum experience. For example, in a

research study conducted at three children's museums in the Seattle, WA area by Vergeront

Museum Planning and Evergreene Research and Evaluation (2013), researchers interviewed

parents/caregivers 15 minutes into their visit. Interview results suggested that children are the

primary deciders of where families go and what they do in the museum. In addition, interview

results indicated that for many families, their experience is largely the same from one visit to

the next.

A dominant trend in the research focused on the importance of physical activity in

children's museums. In a study conducted at the Please Touch Museum, Sykes (n.d.) observed

that the most engaging exhibit elements were those that involve hands-on, large motor skills.

Similarly, in a study of the *EatSleepPlay* exhibit at the Children's Museum of Manhattan, Platkin

et al. (2013) found that exhibits perceived as more "fun" had longer stay times and that

younger children engaged in more physical activity at these exhibits than did older children.

Randi Korn & Associates (2008b), in a summative evaluation of the *CyberChase* exhibit at

Children's Museum of Houston, found that most people chose to participate in a construction

activity because they wanted to build something. In an evaluation of an exhibit on fire safety at the Chicago Children's Museum, Cheng (2010) observed and tracked children and adults. Study results suggested that children were most attracted to exhibits where there was something physical to do, where they could exercise large motor skills.

2) Role of Adults and/or Caregivers

Another third of the studies conducted in children's museums (36%) focus on the role of adults and/or caregivers—how they interact with their children and the ways in which they perceive and facilitate their children's learning experiences. We identified three dominant clusters of findings across these studies: a) there are typographies of parent beliefs and strategies about learning and facilitating in a museum, b) caregivers frequently require or benefit from instruction on how to play with or use exhibits with their children, and c) when parents do scaffold learning experiences and engage with children in museum spaces, learning outcomes improve.

Results from these studies suggest a range of parent involvement strategies take place in the children's museum. In a study conducted at the Children's Museum Pittsburgh, Swartz and Crowley (2004) videotaped 19 parents and their young children (ages 1-5 years) using an exhibit, and then interviewed parents regarding their beliefs about what their children might learn and how they might be involved in that learning. Their results suggest that parents' beliefs about teaching and learning, as well as their familiarity with the museum, influenced the ways in which they interacted with their children at the exhibit. For example, some parents let their children take the lead while other parents used explanations to help their children reflect on what they were doing, and make connections to previous experiences. Swartz and Crowley reported five typologies of parent teaching beliefs. Vergeront Museum Planning and

Evergreene Research and Evaluation (2013) interviewed parents/caregivers and asked them to describe their role in facilitating play during their children's experience in the museum. These researchers found that caregivers described six different roles, with no single role being dominant: 1) observer; 2) supportive/facilitator; 3) family role; 4) friend/playmate; 5) teacher; and, 6) supervisor/guardian. Parents went on to say that the perceived result of their role was a) extending learning; b) building intimate bonds with their kid(s); and c) ensuring safety and security.

Another trend across this subset of studies is that caregivers frequently require or benefit from instruction on how to play with or use exhibits with their children. Downey, Kratnz and Skidmore (2010) conducted a whole-museum evaluation study at the Please Touch Museum, exploring parents' perceptions of play and their role in their children's museum experience. Results from timing and tracking of 168 children (3-10 years) and the adults in their group suggest that only about one-third of adults were observed playing with their children during their visit. The authors hypothesize that parents lack confidence in and knowledge of how to play with their children in a children's museum, and suggest that they are looking to staff for more explicit guidance.

A similar finding is reported by the Garibay Group (2008), in a study of Vietnamese families in at the Children's Discovery Museum of San Jose. This study concludes that first-time Vietnamese families in an exhibit needed more guidance in exploring the museum. Randi Korn & Associates (1999), in a front-end evaluation study of a math exhibit at the Minnesota Children's Museum, found that parents needed simple instructions to facilitate exhibit experiences for their children, as well as assistance in identifying pre-math skills. In the

summative evaluation of the same exhibit, Randi Korn & Associates (2001) reported that while most parents did assist children in understanding the math concepts, parents still required some help in using the exhibition with children.

In one of the few quasi-experimental studies, Benjamin, Haden and Wilkerson (2010) showed that providing parents/caregivers with instructions can enhance the role they play in their children's learning in the museum. Benjamin et al. observed 120 caregiver-child dyads in an exhibit at the Chicago Children's Museum. Before conducting their observations, they grouped the sample into various conditions, with some groups receiving conversation instructions (emphasizing the use of elaborative "wh" questions and associations) and other groups receiving other kinds of instructions or no instructions at all. Study results suggest that caregivers who received the conversation instruction engaged in more caregiver-child joint talk in the exhibit, asking more "wh" questions and making more associations.

Finally, studies on the role of adults/caregivers in the children's museum experience suggest that when parents do engage and/or scaffold learning experiences with children in museums, learning outcomes improve. Haas (1996) concluded that supportive adult interaction is both associated with increased learning in children's museums, and is a critical element for learning in the children's museum environment. Cheng (2010) observed and tracked children and adults at an exhibit on safety at the Chicago Children's Museum, and found that younger visitors and those new to the topic of safety better understood and "got it" when messages were explained by an adult.

STEM skills and concepts in particular are addressed in the findings regarding improved learning outcomes from parent engagement and scaffolding. In the Curious George themed

STEM exhibit evaluated in 2007 by Evergreene Research and Associates, the two primary adult roles observed were "supervisor" and "facilitator." Supervisors are described as having watched over children from a distance to ensure safe and fair play, while facilitators modeled and scaffolded experiences in the exhibit. When children had an adult scaffolding for them through conversation or modeling, children used inquiry skills more often. Crowley et al. noted that parents help shape and support children's scientific thinking in everyday activities, and observed that when children were with their parents at a STEM exhibit, their exploration of evidence was longer, broader, and more relevant than with children who were on their own at the exhibit. Callanan and Braswell (2006) also found that conversations between parents and children at exhibits greatly enhance the chances that children will link their museum experiences to abstract science concepts; more specifically, they found that conversations between parents and children were more likely to address science concepts than were conversations with kids only; also, it closes the gender gap in explanatory conversation identified by Crowley et al. (2001).

Interestingly, research on the role of parents/caregivers also indicates that their behavior does not always "fit" with what museum staff expect to see in the children's museum. For example, Wood and Wolf (2010) draw upon multiple studies conducted at The Children's Museum of Indianapolis, to reveal staff's expectations for how parents and children interact during their visit. Their work shows that while staff expect parents/caregivers to be actively involved in whatever children are doing, parents/caregivers often consciously choose not to interact with their children in order to permit their children to maintain control over their experience. Knutson, Crowley, Russel & Steiner (2011) found a similar trend in their studies at

Children's Museum Pittsburgh. Looking specifically at parents' interactions with their children in the art studio, Knutson et al found that museum staff thought parents should be more involved with their children, even making art themselves. There is some indication that age may be related to the level of caregiver involvement with children in a museum. Platkin et al. (2013) reported that parents in a health exhibit at the Children's Museum of Manhattan gave older children less instruction and help than younger children. Munley (2011) observed differences in engagement between adults and children of different ages in numerous exhibit elements. For instance, she observed that older children "did not seek or want" help with one exhibit on building a beast, whereas younger children worked with parents, and parents would often enter a digging pit and work with younger children, but did not do so with older children. The strength of the relationship between caregiver engagement and age cannot be estimated based on information in the literature, as measures of caregiver interaction by child age are not measured uniformly across studies.

3) Learning Outcomes

Perhaps most relevant to the learning value of children's museums are the studies that seek to measure the learning outcomes that result from experiences in this context. We used the National Science Foundation evaluation framework (Friedman, 2008) to code evidence of outcomes across the studies according to a) knowledge, awareness, and understanding; b) skills; c) attitudes; d) behaviors; and e) interest and engagement.

The most commonly measured outcome in the literature is knowledge, awareness, and understanding. Kuross and Folta (2010) found that a health and fitness program sponsored by a children's museum resulted in adults and children gaining new information about physical

fitness and health. Miller and Daguang (2011) found that children both increased their

knowledge of astronomy from an astronomy program, and also increased their knowledge of

the partner country (China) in the program. Sanford (2009) reported that children gained new

knowledge about manufacturing concepts and processes. Children's Museum of Houston

(2012) found that participant scores in a teacher math training program improved after

participating in the program. Waxman, Dixon, Waltz, Tran & Markello (n.d.) reported from

parent surveys that parents believed their children had learned new technology skills,

vocabulary and were exposed to other cultures. Garibay (2011) found that after participating in

an exhibit about physical activity and play, children became more aware of their body

responses. Tenenbaum, Rappolt-Schlichtman & Zanger (2004) reported that children exposed

to an exhibit on water had a better understanding the behavior of water. Taken together, these

results provide some initial evidence to suggest that children and adults perceive they have

gained or reinforced their knowledge about a particular topic. However, the large majority of

the studies measure this learning outcome through self-report, asking individuals, for example,

if they believe they know more about the topic now. What is needed are studies that employ

more direct measures of awareness and knowledge, and carefully connect that knowledge gain

to the museum experience.

Some studies report that children's museum experiences can enhance children's and/or

adults' skill sets. For the most part, skills seem to revolve around language and literacy.

Benjamin, Haden and Wilkerson (2010) found that caregivers who were provided with more

conversation instruction helped children make more associations, asked more questions, and

engaged in more child-caregiver talk. Sanford (2009) described increased skills and terminology

gained from using components of the manufacturing exhibit at the Children's Museum

Pittsburgh. Participants in a Children's Museum of Houston (2012) math workshop for teachers

increased their math scores after participating, indicating increased math skills. Garibay (2006)

observed that bilingual parents learned more language teaching skills and library skills after

participating in a program for Spanish speaking parents by the Children's Museum of Houston.

Blue Scarf Consulting (2012a) observed that adults who visited the *Storyland* exhibit at the

Minnesota Children's Museum, gained skills and methods to help improve children's literacy

and reading skills.

A few studies report attitudinal outcomes, suggesting that children's museum

experiences may enhance children's and/or adults' appreciation for a particular topic. Kuross &

Folta (2010) evaluated a diet and health program implemented by the Boston Children's

Museum, and found evidence of improved attitudes toward diet and exercise. Garibay (2011)

concluded that children had improved attitudes toward physical fitness and exercise after they

visited the *PowerPlay* exhibit at the Children's Museum of Houston. Randi Korn & Associates

(2008a) found that children had an improved attitude toward math after experiencing the

Cyberchase exhibit at the Children's Museum of Houston.

Only a handful of studies speak to the impacts of children's museums on visitors'

behavior, most often related to health or literacy. Kuross and Folta (2010), in a study of a

childhood obesity program designed by the Children's Museum of Boston, showed that the

program had some positive impact on self-reported, health-related behaviors of participants in

the program. The University of Texas, Health Sciences Center (n.d.) reported that the test group

participating in the family learning involvement program were more likely to increase reading

behaviors. Blue Scarf Consulting (2012c) observed that children reported an increased desire to

read after visiting the *Storyland* exhibit at the Minnesota Children's Museum, and that adults

explicitly stated they would increase literacy supporting behaviors. As is the case with

knowledge and attitudes, behaviors are predominantly measured through self-report, raising

questions about whether people's intended behavior change translates into actual behavior

change.

4) Institutional Practices, Values, and Beliefs

Research in children's museums also speaks to issues associated with the practices,

values, and beliefs of these institutions (24%). There appear to be two broad sets of findings

that describe these principles. One set of findings describes how children's museum

professionals and institutions internally conceive of their role and core values in delivering

service, and a second set of findings describes practices and beliefs about working with groups

outside the institution, including other children's museums.

Some studies have surveyed museum staff to understand the principles that underlie

their work. Results from this research point to the value of children's museums being family-

focused (Ashton, 2011; Bowers, 2012; Cohen, 1989) and interactive (Ashton, 2011; Cohen,

1989; Henderson & Attencio, 2007; Mayfield, 2005). Ashton (2011), in an analysis of four

children's museums, found that museum practitioners design exhibits with physical interaction

in mind, value facilitation by staff or volunteers, and try to balance creativity with functionality.

Adams & Piangerelli (2006) used interviews to find that implementing a model for children's

museum activities and programs, even when the philosophy is widely accepted among the staff,

is more difficult than getting staff to embrace the program. Mayfield (2005) observed 30

children's museums and describes what museum professionals believe are the unique roles of children's museums, as well as trends in exhibits and programs that are currently being facilitated by museums and museum staff.

A subset of these studies focus on cooperating with partners on programs and exhibits, and the perceptions of those partnerships from the perspective of children's museum professionals. Kessler (2010) describes institutional perceptions of cooperation between the Minnesota Children's Museum, Minnesota library systems, and local government on a literacy initiative. Strengths were described as having a shared work ethic, common goals, and greater expertise, though uneven workload was described as a concern. In some cases museums worked with advisory committees, especially within the context of developing cultural exhibits. The practice of developing children's museum programs and exhibits appears to build stronger relationships between the museum and that cultural group in the community. Selinda Research Associates (2008) found that working with the Asian American community on exhibits about Asian culture built stronger relationships between that community and the organization. Garibay (2006) found that relationships between a museum and members of an advisory group for a Vietnamese audience development program strengthened, though members from more closely aligned organizations tended to work harder toward group goals. Shaffer (2012) concludes that museums will need to cooperate not only with each other, but also other groups to gather and share information from research and practice, to include cooperation between children's museums as well as early childhood practitioners and researchers from outside the field.

While the literature reveals some useful information about internal beliefs, practices, and values within children's museums as institutions, as well as some institutional beliefs and practices in cooperating with external groups to deliver services, notably absent are studies evaluating beliefs and values about children's museums from people and groups outside of the children's museum field.

5) Visitor Reactions

Another quarter of the studies conducted in children's museums (23%) measure visitors' reactions to their experience—what they liked and did not like, what they felt could be improved. Again, this is likely a function of the number of evaluation studies within our sample, since evaluation often seeks to provide such feedback. It is difficult to identify trends across these studies, since so much of the work is context-specific. However, at a broad level, it seems to show that children and families respond positively to a range of children's museum experiences, including specific exhibits, programs, and activities. Various factors seem to contribute to visitors' enjoyment of their experience. Garibay (2006) found that Vietnamese visitors to an exhibit appreciated a safe, clean environment, as well as good service. More obvious is the fact that visitors do not seem to like a space being too crowded and hot, and lack of sight lines and interactives that are difficult to operate (Beaumont, 2007). Taken together, these findings suggest that visitors to children's museums look for and value clean, safe, comfortable environments.

6) Learning Strategies

Studies also communicate findings about the strategies museums employ to support learning (17%). Results fall into two major categories, those that emphasize the role of play

within the children's museum experience and those that focus on learning supports more broadly. It is clear from the literature that play is a central feature of children's museums. There is general agreement that the children's museum environment is designed with play in mind (Mayfield, 2005; Henderson & Atrencio, 2007), play and physical interaction are a key values of exhibit design (Henderson & Atrencio, 2007, Ashton, 2011), and opportunities for play learning are appreciated by children and adults alike (Munley, 2011; Sykes, n.d).

Some studies focus on how visitors play in children's museums, and the various types of play that occur. In a research study of three different children's museums in Seattle, Vergeront Museum Planning and Evergreene Research and Evaluation (2013) asked parents/caregivers to compare their kids' play at the children's museum to their play in other settings, and indicated that at the museum, the play was more learning-based, and more social in nature. Selinda Research Associates, Inc. (2008) evaluated a series of exhibits on Asia as part of the Association of Children's Museums Freeman Foundation Asian Exhibit Initiative. Across exhibits they observed several types of play learning occurring and generated a list of play learning styles, including epistemic, gaming, and ludic play. Beaumont (2004) evaluated an early literacy learning program at the Minnesota Children's Museum and observed parent-child dyads playing in a literacy exhibit about stories. In this instance, when adults engaged with children they filled specific roles such as "observer," "player," "stage manager," "mediator," "scribe," and "social director." The "observer" and "player" roles were by far the most common, with adults either watching the children play or actively playing themselves. In a separate evaluation of the *Curious George* exhibit at the same museum, Beaumont (2007) found that in this space fewer adults were players, and more acted as facilitators and supervisors.

There are numerous specific and anecdotal examples in the literature describing how children play in specific exhibits. For example, Cheng (2010) describes children engaging in imaginative play acting as firefighters in a safety exhibit; Wolf, Warren & Wood (2011) describe how boys tended to prefer playing in the Marketplace and Herbalist Shop in an exhibit on Egypt, while girls preferred the Apparel Shop, Arabesque, and Inlay Activity; and Munley, Rossiter & Rossiter-Munley (2011) describes several types of play observed at various parts of a play space, such as how children interact with a large model Jeep.

Thompson, McCrink & Bushara (n.d.) studied the *Playworks* exhibit at the Children's Museum of Manhattan, to investigate how children's museums foster learning through play, and observed parent-child dyads at play to explore how play contributes to children's development. The researchers concluded that play aids in a) language development, as the context is a forum for language learning; and b) social interaction. Even though children's museums are designed with play learning in mind, and despite evidence that children learn through play, Munley, Rossiter & Rossiter-Munley (2011) concludes that parents do not necessarily understand the role of play in children's museums.

A second trend within the studies focused on learning strategies is focused on the supports that children's museums provide for use outside of the museum context. While these learning supports appear to be a secondary strategy, they are employed by many children's museums. Tools for practitioners in formal education represent one of these supports. Spybrook and Walker (2012) describe a cooperative program between an unspecified children's museum and pre-service teachers. Researchers observed participant teachers in the program as they developed and deployed literacy embedded play centers in the museum. The museum

contributed by providing the environment and capacity for this teacher development activity, and researchers observed that teachers were able to apply theory to practice by developing exhibits in the museum space. Coppola (2005) evaluated a program operated by the Children's Museum of Houston that provided teachers with math kits related to a math exhibit, for use in the classroom. He found that teachers used kits to reinforce what was already taught in class, and that some teacher coaching was required to best draw the math lessons from the kits.

The Children's Museum of Houston (2012) also hosted a summer math series program to provide teacher math training utilizing resources from their math exhibits. Using pre-workshop and post-workshop assessments, they found that the math scores of workshop participants increased after participating in the teacher workshops. In an evaluation of *One World Sky*, a bi-national exhibit about astronomy used in the United States and China, Miller & Daguang (2011) explored the impact on teachers and classes invited to visit the exhibit and related programs. They found that the exhibit motivated teachers to engage in follow-up activities and plan outings to other informal science learning settings.

Another form of learning support developed and implemented by some children's museums is coaching for families and caregivers, in an effort to provide tools for caregivers to understand and facilitate learning outside of the museum. These supports are primarily delivered in the program format, or are programs associated with exhibits, and differ from coaching about "how to teach" with physical exhibits within the museum. In an evaluation of the program *Para los Ninos*, a literacy program at the Children's Museum of Houston, for caregivers whose first language is Spanish, Garibay (2006) interviewed and surveyed participants. Garibay found that although book circulation by program participants did not

increase, the program provided more resources to Spanish speakers than they had before, that

caregivers enjoyed the program, and that caregivers learned new literacy skills and applied

skills they gained at home. The University of Texas, Health Sciences Center evaluated a *Family*

Learning Involvement Program book reading program and determined that while there was no

difference in assessment scores between program participants and non-participants, parents

discovered new interests of their children and were more likely to change reading behaviors.

Blue Scarf Consulting (2012a, 2012b, 2012c) found in a series of evaluations of the *Storyland*

literacy exhibit at the Minnesota Children's Museum that adults gained new understanding of

how they can help improve their children's literacy skills outside of the museum.

Efforts to extend tools and resources to schools and parents for use outside of the

children's museum suggest a commitment by museums to contribute to children's learning

across the boundaries of the physical museum, and that there is interest and value in

developing institutional capacity to contribute to learning more broadly in the communities

museums serve by providing learning supports to families and formal educational institutions.

3) What evidence do children's museum professionals want in support of the learning value of their institutions?

<u>Overview</u>

As part of the survey administered to children's museum professionals in the spring of

2013, respondents were asked, "What research questions/issues would best inform practice at

your museum in the coming years?" This line of inquiry was meant to elicit the questions and

issues that are seen as most pressing, informative and useful for children's museums moving

forward. (The survey methods are described on page 3.)

Children's museum professionals were asked "In the interest of collecting and
prioritizing the needs of the field, what research questions/issues would best inform practice at
your museum?" Responses were coded into one of five emergent categories: 1) impacts; 2)
learning experience; 3) audience; 4) methods; and 5) best practices. Table 15 shows the
distribution of responses across these five categories, and suggests that what professionals
think is most needed to inform practice at their institution is research on the impacts of
children's museums, followed closely by research on how people learn in children's museums
and the specific aspects of the learning experience that contribute to learning.

Table 15. Evidence wanted by children's museum professionals to inform practice (N=106).

Evidence Wanted	N
Impacts	33
Learning Experience	29
Audience	16
Methods	3
Best Practices	2

Responses coded as "impacts" tended to focus on documenting the outcomes of the
children's museum experience on children and families. Some specific examples of impacts that
children's museum practitioners want include:

How do we gather evidence that learning is occurring or attitudes are being

positively affected?

How do we measure long term impacts of exhibits and programs on children and

families?

What are the social/emotional development impacts of children's museums?

We are most interested in how we make the case for our impact as distinct from

the other influences on children's lives.

Responses coded as "learning experience" tended to address research needs that would elucidate the aspects of the children's museum learning environment that contribute best to children's development. Examples include:

How can museums best help parents be the "first and most important" teachers?

How do repeat visitors/members build on their experiences over time as their

children grow?

Research that points to how certain generalizable aspects of exhibits work or do

not work.

Responses coded as "audience" were those that focused on understanding the motivations and beliefs of visitors, as related to children's museums generally and the activities within them more specifically. Examples include:

Why do families participate in museum programs with their children?

How do families select cultural experiences? Do they think of children's museum

experiences as a cultural experience?

Finally, some children's museum professionals reported that they would like to see research on specific methods used by children's museum professionals, in order to determine best practices. An example of this is a request for research into *methodology for evaluating learning outcomes*.

Discussion and Conclusions

This landscape review is intended to document what is known and not known about the learning value of children's museums and to set the stage for international conversations about what issues and measures might frame a field-wide research agenda for children's museums. We sought to answer three key questions in this paper, each of which offers a particular perspective on the current evidence-base: 1) What impacts do children's museum professionals aspire to have on their constituencies? 2) What evidence exists in the literature about the learning value of children's museums? 3) What evidence do children's museum professionals say they need most to demonstrate the learning value of their institutions?

1) What impacts do children's museum professionals aspire to have on their constituencies?

We received responses from 106 professionals representing 69 children's museums across the country. Mostly CEOs and Directors of Education responded, and three key findings emerged from their feedback. First, professionals in this sample seemed to feel strongly that children's museums are unique learning environments, with impacts that are distinct from other museums. In particular, they emphasized that children's museums a) define their target audience more narrowly than others, with a focus on children and families; b) seek to create experiences that are interactive, hands-on, and play-based; and c) focus less on content learning and more on the holistic development of the learner. We believe that these perceptions may have implications for the process of building a research agenda for children's museums. If children's museums are seen as unique learning environments, then the evidence for their value and impact necessarily needs to come from research conducted in that environment. However, if children's museums are seen as similar to other museums, then the

evidence for their value and impact can be based in part on research conducted in museums more broadly, where there exists a much deeper body of work. In other words, clarifying the nature of the learning context will help to clarify the parameters of the desired evidence. The literature review reported here only focused on studies that were conducted in the children's museum context; further review of research in other contexts may be useful.

Second, professionals surveyed here believe that while the children's museum experience ideally results in a range of outcomes, social and emotional growth may be the most important emphasis for these institutions. This aspiration presents a possible research direction for the field since currently there is little evidence of such outcomes in the literature.

Finally, data from our survey suggests that a number of children's museums across the country are currently engaged in research and evaluation efforts (92% of professionals surveyed said their museum has done an internal evaluation in the last 12 months; 60% said their museum has contracted with an external evaluator in the last 12 months). These efforts offer an opportunity to leverage existing institutional work to generate field-wide knowledge. What if a group of children's museums agreed on even one or two key questions or measures that could be employed across their institutional studies? The data could be aggregated and results generalized as a way of beginning to generate an evidence-base that is potentially meaningful to more than one institution.

2) What evidence exists in the literature about the learning value of children's museums?

There is not a lot of research that has been done in children's museums to date. What has been done is largely evaluative in nature, owned by individual institutions and/or evaluation firms and not always shared with the field at large. Access to research is paramount

in the building of a field-wide evidence-base. Relevant models exist, for example the Center for the Advancement of Informal Science Education's (CAISE) informalscience.org. What if researchers and evaluators working in children's museums committed to posting all of their studies, internal and external, on informalscience.org? Would a children's museum-specific infrastructure make more sense, and if so, what would it look like? Can the Association of Children's Museums' Research Exchange serve this purpose? Answers to these questions will help the field address critical issues of access.

Research that has been done in children's museums is largely descriptive, and tends to focus on visitor behaviors and reactions—what people do in children's museums, where they stop, how much time they spend, and what they seem to like and not like. These studies suggest that children's museums are popular and that people generally appreciate and enjoy their experience.

There is a small body of work that looks specifically at the role of parents and caregivers in the children's museum. This work indicates a range of parent involvement and facilitation strategies, potentially influenced by parents' understandings of the goals of children's museums, and their beliefs about their own role in their children's learning. As children's museums continue to broaden their focus from children to families, understanding how to meaningfully engage parents/caregivers continues to be a crucial research issue.

Research that measures the impacts of children's museums—how they make a difference in the lives of children and families, and in the fabric of their community—is lacking in the literature. In her review of the literature on early learners in museums, Munley (2012) found a similar gap in the research, noting that "...the challenge is to introduce museum, early

childhood and public policy professionals to each other so that they can…conduct rigorous research studies to advance knowledge and produce evidence of the immediate and lifelong value of museum learning for our youngest children" (p. 21).

There is some evidence of knowledge gain that results from visits to a children's museum, and a few studies that point to the potential for attitudinal shifts and skills development. There is no evidence in the literature of social and/or emotional growth resulting from the children's museum experience, an interesting finding in light of the fact that children's museum professionals seem to feel that this outcome is paramount. This may also constitute an important future research direction.

3) What evidence do children's museum professionals want in support of the learning value of their institutions?

When asked what evidence they need most to support the learning value of their institutions, the children's museum professionals we surveyed said they wanted evidence of impacts, in particular long-term impacts, as well as evidence of how children and families learn in children's museums, in particular what it is about the exhibits and programs that contribute to their learning. This requested evidence dovetails nicely with the gaps in the literature itself, and reinforces the research avenues articulated from the literature review.

In summary, we hope that this paper has provided a snapshot of the current evidence supporting the learning value of children's museums. We also hope that it stimulates ongoing conversations about how to best bolster this evidence-base with rigorous, meaningful research that will inform practice in children's museums across the country.

References

Adams, M., & Piangerelli, E. (2006). *Changing practice: An evaluation of the implementation of the DEEP Initiative* (Unpublished evaluation report). Edgewater, MD: Children's Museum of Houston.

Allen, S. (2007). *Secrets of Circles: Summative evaluation report* (Unpublished evaluation report). San Mateo, CA: Children's Discovery Museum of San Jose.

Anna, C. (1995). Monsters in the museum: Reading instruction in a children's museum. *The State of Reading: Journal of the Texas State Reading Association*, *2*(1), 29–33.

Apley, A., Frankel, S., Goldman, E., & Streitburger, K. (2011). *Supporting museums-serving communities: An evaluation of the Museums for America program* (Unpublished evaluation report). Washington DC: Institute of Museum and Library Services.

Ashton, S. D. (2011). *High priority design values used by successful children's museum exhibit developers: A multiple case study analysis of expert opinions* (Unpublished master's thesis). Brigham Young University, Provo, UT.

Beaumont, L. (2004). *Summative Evaluation of Jump to Japan* (Unpublished evaluation report). St. Paul: Minnesota Children's Museum.

Beaumont, L. (2007). *Summative Evaluation of Minnesota Children's Museum Curious George: Let's get curious* (Unpublished evaluation report). St. Paul: Minnesota Children's Museum.

Benjamin, N., Haden, C., & Wilkerson, E. (2010). Enhancing building, conversation, and learning through caregiver-child interactions in a children's museum. *Developmental Psychology*, *46*(2), 502-515.

Blue Scarf Consulting. (March 2012a). *Storyland: A trip through childhood favorites summative evaluation report of findings* (Unpublished evaluation report). Minnetonka, MN: Minnesota Children's Museum.

Blue Scarf Consulting. (2012b). *Storyland: A trip through childhood favorites comparison of findings from large and small exhibit evaluation* (Unpublished evaluation report). Minnetonka, MN: Minnesota Children's Museum.

Blue Scarf Consulting. (August 2012c). *Storyland: A trip through childhood favorites summative evaluation report of findings* (Unpublished evaluation report). Minnetonka, MN: Minnesota Children's Museum.

Bowers, B. (2012). A look at early childhood programming in Museums. *Journal of Museum Education*, *37*(1), 39–48.

Callanan, M., & Braswell, G. (2006). Parent-child conversations about science and literacy: Links Between Formal and Informal Learning. In Z. Beckerman, N. Burbules, & D. Silberman-Keller, (Eds.), *Learning in Places: The Informal Education Reader* (123-138). New York, NY: Peter Lang.

Carey, C. (2010). *Audience research: Understanding families' perceptions of living things in their communities* (Unpublished evaluation report). Boston, MA: Boston Children's Museum.

Cheng, B. (2010). *Play it safe evaluation* (Unpublished evaluation report). Chicago Children's Museum.

Children's Museum of Houston. (2012). *Summer math series 2012 project evaluation* (Unpublished evaluation report). Houston, TX: Children's Museum of Houston.

Children's Museum of Houston. (2013). *Summer of learning program evaluation* (Unpublished

evaluation report). Houston, TX: Children's Museum of Houston.

Cohen, S. (1989). Fostering shared learning among children and adults: The children's museum.

Young Children, *44*(4), 20–24.

Coppola, E. M. (2005). *The Children's Museum of Houston Exxon-Mobil Magnificent Math*

Moments evaluation of classroom activities (Unpublished evaluation report). Houston, TX:

Children's Museum of Houston.

Crowley, K., Callanan, M. A., Jipson, J.L., Glaco, J., Topping, K., & Shrager, J. (2001). Shared

scientific thinking in everyday parent-child activity. *Science Education, 85*, 712-732.

Crowley, K., Callanan, M.A., Tenenbaum, H.R., & Allen, E. (2001). Parents explain more often to

boys than to girls during shared scientific thinking. *Psychological Science, 12*, 258-261.

Crowley, K., & Galco, J. (2001). Everyday activity and the development of scientific thinking. In

K. Crowley, C.D. Schunn, & T. Okada (Eds.), *Designing for science: Implications from*

*everyday, classroom, and professional settings (*393-413). Mahwah, NJ: Lawrence Erlbaum

Associates, Inc., Publishers.

Downey, S., Krantz, A. & Skidmore, E. (2010). The parental role in children's museums:

Perceptions, Attitudes, and Behaviors. *Museums and Social Issues* 5(1), 15-34.

Ellenbogen, K. M., Luke, J. J., & Dierking, L. D. (2004). Family learning research in museums: An

emerging disciplinary matrix? *Wiley InterScience*, S48–S58.

Friedman, A. (Ed.). (2008). *Framework for evaluating impacts of informal science education*

projects. Retrieved from http://insci.org/resources/Eval_Framework.pdf

Garibay, C. (2006). *Children's Museum of Houston Para los ninos: Phase two evaluation* (Unpublished evaluation report). Chicago, IL: Children's Museum of Houston.

Garibay, C. (2011). *PowerPlay summative evaluation* (Unpublished evaluation report). Chicago, IL: Children's Museum of Houston.

Garibay Group. (2008). *Vietnamese audience development initiative* (Unpublished evaluation report). Children's Discovery Museum of San Jose.

Garibay Group. (2012). *Vietnamese audience development initiative phase II* (Unpublished evaluation report). Children's Discovery Museum of San Jose.

Gaskins, S. (2008). The cultural meaning of play and learning in children's museums. *Hand to Hand.* Association of Children's Museums, 22(4), 1–2, 8–11.

Gyllenhaal, E.D. (2004). Literature review about interactivity for the evaluation of Asian Exhibits Initiative for the Association of Children's Museums and the Freeman Foundation (Unpublished report). San Francisco, CA: Selinda Research Associates, Inc.

Haas, N. T. (1996). Project Explore: How children are really learning in children's museums. *The Visitor Studies Association*, 63–69. Retrieved from http://archive.informalscience.org/researches/VSA-a0a0y3-a_5730.pdf

Haensly, P. (n.d.). Children's museums: Meaningful processing or superficial surfing? *Gifted Child Today Magazine*, *21*(3), 4.

Henderson, T. Z., & Atencio, D. J. (2007). Integration of play, learning, and experience: What museums afford young visitors. *Early Childhood Education Journal (35),* 245–251.

Kessler, C. (2010). *Supporting early literacy learning: Summative report of findings* (Unpublished evaluation report). Minnesota Children's Museum.

Kessler, C. (2011). *Science + You: Summative Evaluation Report of Findings* (Unpublished evaluation report). Minneapolis, MN: Kohl Children's Museum.

Klein, C. (2010). *Teenage designers of learning places for children: Creating after-school environments for STEM education* (Unpublished evaluation report).

Knutson, K., Crowley, K., Russell, J. L., & Steiner, M. A. (2011). Approaching art education as an ecology: Exploring the role of museums. *Studies in Art Education: A Journal of Issues and Research*, *52*(4), 310–322.

Kuross, E., & Folta, S. (2010). Involving cultural institutions in the prevention of childhood obesity: The Boston Children's Museum's GoKids project. *Journal of Nutrition Education and Behavior*, *42*(6), 427–429.

Leung, P. (2012). *An evaluation of the parent Stars Program at the Children's Museum of Houston* (Unpublished evaluation report). Houston, TX: Graduate College of Social Work, University of Houston.

Luce, M.R., Callanan, M.A., & Smilovic, S. (2013). Links between parents' epistemological stance and children's evidence talk. *Developmental Psychology*, *49*(3), 545-61.

Mayfield, M. I. (2005). Children's museums; Purposes, practices and play? *Early Child Development and Care*, *175*(2), 179–192.

Michael Cohen Group, Dynamic Research and Hunter College CUNY School of Public Health. (2011). *Impact of EatSleepPlay™ Pilot Programs on the health knowledge, attitudes and behaviors of families, childcare providers, head start staff and children* (Unpublished evaluation report). Children's Museum of Manhattan.

Miller, J. D., & Daguang, L. (2011). *The impact of One World One Sky on children's interest and learning about astronomy* (Unpublished evaluation report). Ann Arbor, MI: International Center for the Advancement of Scientific Literacy, University of Michigan.

Munley, M.E. (2012). *Early learning in museums: A review of the literature* (Unpublished report). Chicago, IL: Smithsonian Institution's Early Learning Collaborative Network and Smithsonian Early Enrichment Center.

Munley, M. E., Rossiter, C., & Rossiter-Munley, J. (2011). *Summative evaluation report of findings: Play Museum at the Illinois State Museum* (Unpublished evaluation report). Chicago, IL: Illinois State Museum.

Platkin, C., Zarcadoolas, C., Leung, M. M., Yeh, M. C., Nestler, S., Kwan, A., & Agaronov, A. (2013). *Evaluation of the Children's Museum of Manhattan's EatSleepPlay™ exhibit* (Unpublished evaluation report). Children's Museum of Manhattan.

Randi Korn & Associates. (1997). *A summative evaluation of Breaking Ground* (Unpublished evaluation report). Alexandria, VA: Brooklyn Botanic Garden and the Brooklyn Children's Museum.

Randi Korn & Associates, Inc. (1999). *1, 2, 3 Ready? Set. Go! Front-End evaluation: Summary of museum interviews* (Unpublished evaluation report). Alexandria, VA: Minnesota Children's Museum.

Randi Korn & Associates, Inc. (2001). *The Minnesota Children's Museum Go Figure! summative evaluation* (Unpublished evaluation report). Alexandria, VA: The Minnesota Children's Museum.

Randi Korn & Associates, Inc. (2008a). *Exhibition evaluation summative evaluation of Cyberchase: The Chase Is On!* (Unpublished evaluation report). Alexandria, VA: Children's Museum of Houston.

Randi Korn & Associates, Inc. (2008b). *Exhibition evaluation summative evaluation of Cyberchase: The Chase Is On!* (Unpublished evaluation report). Alexandria, VA: Children's Museum of Houston.

Randi Korn & Associates, Inc. (2008c). *Summative evaluation of the Skyline exhibition* (Unpublished evaluation report). Alexandria, VA: Chicago Children's Museum.

Randi Korn & Associates, Inc. (2011a). *Community of learners impact study: Mammoth Discovery!* (Unpublished evaluation report). Alexandria, VA: Children's Discovery Museum San Jose.

Randi Korn & Associates, Inc. (2011b). *Summative evaluation: Children's Library and Discovery Center at Queens Central Library* (Unpublished evaluation report). Alexandria, VA: Queens Central Library.

Randi Korn & Associates, Inc. (2011c). *State-of-the-Profession Study: Science in Children's Museums* (Unpublished evaluation report). Alexandria, VA: Children's Discovery Museum of San Jose.

Stepping Stones Museum for Children. (2011). *Healthyville® Summative Exhibit Evaluation* (Unpublished evaluation report). Stepping Stones Museum for Children.

Sanford, C.W. (2010). Evaluating family interactions to inform exhibit design: Comparing three different learning behaviors in a museum setting. *Visitor Studies*, *13*(1), 67–89.

Sanford, C. (2009). *How People Make Things summative evaluation*. Pittsburgh: Children's

    Museum of Pittsburgh.

Selinda Research Associates, Inc. (2008). *The Freeman Foundation Asian Exhibit Initiative*

    Research Report. Washington, DC: Association of Children's Museums.

Shaffer, S. (2012). Early learning: A national conversation. *Journal of Museum Education*, *37*(1),

    11–16.

Spybrook, J., & Walker, S. L. (2013). Creating inclusive, literacy-embedded play centers in a

    children's museum: Connecting theory to practice. *Early Childhood Teacher Education*,

    14(11), 37–41.

Swartz, M. I., & Crowley, K. (2004). Parent beliefs about teaching and learning in a children's

    museum. *Visitor Studies Today*, *7*(2), 1, 5–16.

Sykes, M. (n.d.). *Evaluating exhibits for children: What Is a meaningful play experience?*

    (Unpublished evaluation report). Please Touch Museum.

Tenenbaum, H. R., Rappolt-Schlichtmann, G., & Zanger, V. V. (2004). Children's learning about

    water in a museum and in the classroom. *Early Childhood Research Quarterly*, *19*, 40–58.

The Children's Museum of Indianapolis (2006). *Annual assessment of family learning*

    (Unpublished report). Indianapolis, IN: The Children's Museum of Indianapolis.

The University of Texas, Health Sciences Center at Houston. (n.d.). *The Family Learning*

    Involvement Program (FLIP): Results of an enhanced parent-child book-reading program

    (Unpublished evaluation report). Children's Museum of Houston.

Thompson, M., McCrink, K., & Bushara, L. (n.d.). *How children's museums can facilitate the*

    study of child development: A case study of Playworks at the Children's Museum of

Manhattan (Unpublished technical report). New York, NY: Barnard College, Columbia University.

Valle, A., & Callanan, M.A. (2006). Similarity comparisons and relational analogies in parent-child conversations about science topics. *Merrill-Palmer Quarterly, 52*(1), 96-124.

Vergeront Museum Planning & Evergreene Research and Evaluation (2013). *Partners in Play: Report of Findings* (Unpublished research report). Minneapolis, MN: Children's Museum of Tacoma, Imagine Children's Museum, and KidsQuest Children's Museum.

Waxman, H. C., Dixon, J., Waltz, A., Tran, T., & Markello, C. (n.d.). *Summative evaluation of visitors' perceptions of learning at the Children's Museum of Houston* (Unpublished evaluation report). University of Houston.

White, R.E. (2013). *The power of play: A research summary on play and learning.* Children's Museum of Minnesota. Retrieved from http://www.mcm.org/play-and-learning/research-summary/

Wolf, B., & Warren, C. (2011). *Take me there: Egypt* (Unpublished evaluation report). Indianapolis, IN: The Children's Museum of Indianapolis.

Wolf, B., & Wood, E. (2012). Integrating scaffolding experiences for the youngest visitors in museums. *Journal of Museum Education*, *37*(1), 29–38.

Wolf, B. (2009). *Review of family learning 2006-2008* (Unpublished report). Indianapolis, IN: The Children's Museum of Indianapolis.

Wolf, B. (2009). *The power of children: Making a difference* (Unpublished evaluation report). Indianapolis, IN: The Children's Museum of Indianapolis.

Wolf, B. (2011). *The evolution of family learning at The Children's Museum of Indianapolis* (Unpublished report). Indianapolis, IN: The Children's Museum of Indianapolis.

Wolf, B. (2013). *National Geographic treasures of the Earth: In-depth exhibit and family learning report* (Unpublished evaluation report). Indianapolis, IN: The Children's Museum of Indianapolis.

Wood, E., & Wolf, B. (2010). When parents stand back is family learning still possible? *Museums and Social Issues*, 5(1).

Wood, E., & Wolf, B. (2008). Between the lines of engagement in museums. *Journal of Museum Education*, *33*(2), 121–130.