

Staff-Mediated Learning in Museums: A Social Interaction Perspective

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**Abstract**

Educators, docents, and interpreters are considered integral to the learning experiences at many museums. Although there is growing recognition that these staff members need professional development to effectively support visitor learning, there has been little research to describe their work or identify effective facilitation strategies. To address this need, we explored the nature of unstructured staff-facilitated family learning at the Oregon Museum of Science and Industry, Portland, OR, videotaping and inductively analyzing 65 unstructured staff-family interactions. The analysis highlighted the importance of role negotiation between staff and adult family members, particularly during the initiation of interactions staff and visitor facilitation of family learning and the introduction of new learning goals by staff members. Aligned with prior research on family learning in museums, adult family members played a critical role in shaping the nature of the interactions and determining the level of involvement of staff members. Findings have important implications for both future research and the professional development of staff.

*Keywords:* informal learning, free-choice learning, interpretation, museum education, social interaction, role negotiation

### **Staff-Mediated Learning in Museums: A Social Interaction Perspective**

While museum researchers have long argued that interactive exhibits support visitor learning (Dierking & Falk, 1994; National Research Council [NRC], 2009), recently there has been increased focus on how staff facilitation influences these experiences. This interest has been fueled by the recognition that staff<sup>1</sup> potentially play a powerful role in mediating learning in museums, fostering personal connections, tailoring the content and the depth of experiences for different visitors, and serving as learning models and guides (Astor-Jack, Whaley, Dierking, Perry, & Garibay, 2007; NRC, 2009). In response, an increasing number of institutions are creating professional development programs for front-line interpreters. Traveling exhibitions now often include training programs or materials for museum educators, and funding agencies, such as the National Science Foundation, have made professional development for interpretive staff an important part of their portfolios (e.g., *Successful Scaffolding Strategies in Urban Museums* [DRL-0515468], *Communicating Ocean Sciences Informal Education Network* [DRL-0917614], *Zoo and Aquarium Action Research Collaborative* [DRL-1114335] and *Access Algebra* [DRL-0714634]).

Despite this growing attention, it is widely recognized that the characteristics of successful staff-mediated learning are poorly understood (Aster-Jack et al., 2007; Falk & Dierking, 2000; NRC, 2009), especially when compared to effective exhibition design strategies (Mony & Heimlich, 2008). The recent synthesis report on learning science in informal environments (NRC, 2009) referenced only one study focused on staff-mediated learning (i.e., Schauble et al., 2002) and highlighted unanswered questions about the contexts in which such

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<sup>1</sup> Throughout this article, we use the terms *staff*, *volunteers*, *museum educators*, and *front-line interpreters* to refer to paid and unpaid staff who work in museums, science centers, and other informal or free-choice learning environments and whose primary responsibility is to facilitate learning experiences for visitors, including families, adults, seniors, and school groups.

mediation is appropriate and the potential for staff members to interfere with the visitor experience (p. 162). The authors argued that front-line interpreters need support and professional development to effectively facilitate learning for the diversity of visitors to free-choice and informal learning settings.

Aligned with these recommendations, we argue that a clear understanding of how staff mediation influences learning in museums, and the factors that contribute to successful interactions, is necessary to identify effective facilitation approaches and design professional development for museum educators. Because so little research exists in this area, particularly for unstructured staff-family interactions (described below), the purpose of this qualitative study was to explore the nature of interactions between museum educators and families and to build a baseline understanding of staff-mediated learning in museums.

### **Staff-Mediated Learning in Museums**

Museum educators engage with visitors in a variety of ways, including *structured* interactions, such as museum tours, stage shows, or classroom programs, in which the length of interaction and the relationship between visitors and staff are largely predetermined (Cunningham, 2004), and *unstructured* interactions, such as unscripted conversations between staff and visitors at activity tables or exhibits. Researchers focused on structured interactions have investigated school group programs and tours (Cox-Peterson et al., 2003; Flexer & Borun, 1984; Jarvis & Pell, 2005; Tal & Morag, 2007; Tran, 2007; Wollins, Jensen, & Ulzheimer, 1992), scheduled demonstrations for everyday visitors (Anderson, Piscitelli, Weier, Everett, & Taylor, 2002), and interactions between staff and visitors in highly structured research settings (Allen & Gutwill, 2009). Findings suggest that visitors often have positive feelings about engaging with museum staff (Anderson et al., 2002; Falk & Dierking, 2000; Jarvis & Pell, 2005;

Lindemann-Matthies & Kamer, 2005; Marino & Koke, 2003; Wollins et al., 1992). In addition, there is evidence that the presence of staff can increase visitor satisfaction, time spent at exhibits (Anderson, Kelling, Pressley-Keough, Bloomsmith, & Maple, 2003; Dierking et al., 2004; Falk & Dierking, 2000; Marino & Koke, 2003), knowledge acquisition (Flexer & Borun, 1984; Lindemann-Matthies & Kamer, 2005; Marino & Koke, 2003), and inquiry behaviors (Allen & Gutwill, 2009).

A few studies of structured interactions have suggested potential negative impacts (Flexer & Borun, 1984; Marino & Koke, 2003; NRC, 2009), including staff interfering with visitors who wish to engage individually with an exhibit (Marino & Koke, 2003). Also, staff members may often employ didactic strategies resembling teacher-directed classroom instruction. For example, studies of staff-guided school group visits (Cox-Peterson et al., 2003; Tal & Morag, 2007) highlighted the use of closed or fact-based questions, high-level vocabulary, limited opportunities for social interaction, inflexible lesson structures, and a focus on facts rather than big ideas. In rare cases, highly skilled and experienced educators have been shown to be able to adapt the structure and content of lessons to accommodate students' prior knowledge and experiences while preserving the free-choice nature of their interactions (Tran, 2007).

Historically, the research community has paid less attention to unstructured interactions, even though they likely represent the most common type of staff-mediated experience in museums. Two notable exceptions are a mixed-method study with educators at a zoo (Mony & Heimlich, 2008) and a qualitative study of interpreters at a living history museum (Rosenthal & Blankman-Hetrick, 2002). Exploring the factors influencing message communication in docent-visitor interactions, Mony and Heimlich found that the length of the interactions and the number of key educational messages communicated were influenced by location ("exhibit region"),

visitor group composition, and how the interactions were initiated. Staff-visitor interactions with adult groups were longer and included more educational messages. Interactions were also longer when staff approached visitors, although the number of messages communicated was similar. Rosenthal and Blankman-Hetrick investigated unstructured staff-visitor interactions in a living history museum. Analysis of videotape from five families during their visits suggested that appropriately designed staff facilitation integrating visitor interest and prior knowledge prompted families to engage in more learning conversations during and subsequent to the interactions. Approaches that actively engaged the entire family in a dialogue also promoted more learning conversations. Findings from these two studies suggest that the nature and outcomes of unstructured interactions may be particularly sensitive to the social dynamics between staff and families.

### **Perspectives from Research on Social Interaction**

Although studies of social interaction in sociology, sociolinguistics, and anthropology offer key insights into the rules and patterns that govern everyday social encounters, they have rarely been applied to the study of behavior and learning in museums (vom Lehn, Heath, & Hindmarsh, 2001). A defining characteristic of human interaction from these perspectives is the negotiation of roles, relationships, and identities. In some of the earliest work on everyday social interaction, Goffman (1959, 1967, 1981) asserted that impression management, or "face work," was a principal goal of all social interaction and communication. Subsequent research on impression management, or how participants in a conversation or social interaction communicate their self-image or identity to other participants, has continued to support this assertion (Canary, Cody, & Manusov, 2000; Kendon, 1990; Lerner, 1996; Nevile & Rendle-Short, 2009). Since Goffman, researchers have made significant headway in describing the interactional rules and

patterns that define the "rituals and customs" of everyday interactions and allow individuals to negotiate roles and identities. For example, conversational analysis of everyday interactions has highlighted the importance of opening and closing sequences, turn-taking practices, methods for avoiding overlap and gaps during conversations, the organization of talk into sequences, and strategies for "repair" (i.e., restoring face) (Gumperz & Hymes, 1972; Mchoula, 1978; Neville & Rendle-Short, 2009; Schegloff, 1999). During these interactions, participants also negotiate the meaning and goals of the situation, or "situation definition" (Rowe, 2005), which serves as the background for interpreting roles and relationships.

Research suggests that much of the work of negotiating roles, relationships, and situation definitions occurs in the initial stages of a social interaction, referred to as the greeting or opening sequence (Goffman, 1981; Gumperz & Hymes, 1972; Kendon, 1990; Schegloff, 1972, 1986). One reason that this initial phase is so important in social discourse is that much of what follows, including the topic of conversation and the patterns and rules that govern conversation structure and participant behavior, is dependent on the relationships and identities negotiated by participants (Gumperz & Hymes, 1972; Kendon, 1990; Schegloff, 1986; Scollon, 1998). Scollon argued that defining the relationship between participants in a conversation is a necessary step before the topic of that conversation can be established.

The physical and social context of an encounter can also predefine interactional roles or leave them open for negotiation. In many situations, relationships between individuals have been "conventionalized" (Scollon, 1998) or "institutionalized" (Goffman, 1967), based on broadly established sociocultural norms, with identity and role negotiation playing a minor role (Filliettaz, 2005; Goffman, 1967; Gumperz & Hymes, 1972; Scollon, 1998). For example, classroom discourse between students and teachers has traditionally been highly structured, with



cultural expectations largely predetermining the roles, relationships, and power structures between teacher and student and among students (Mchoula, 1978; NRC, 2005; Wertsch, 1998).

In other contexts, relationships between individuals can be more ambiguous. George (2008) described the challenges of role negotiation involved in "expert service work," such as professional fitness trainers, and noted that "unlike professional work, where the contents of the service and the role relations of the participants are more clearly defined and regulated, expert service work often takes place in unstandardized industries marked by ambiguous interactional roles" (p. 115). Research on the professional identities of museum educators (Tran, 2007, 2008) suggests that their roles closely mirror expert service work and that they likely face similar challenges in establishing their identities and negotiating roles and relationships during interactions with visitors.

### **Theoretical Framework**

The research described above indicates that the negotiation of roles, relationships, and situation definitions (defined broadly to include the smooth, seemingly effortless negotiations involved in everyday life, as well as the sometimes contentious negotiations) is central to human interaction. To explore these dynamics in the context of staff-mediated learning in museums, we framed learning and development from a sociocultural perspective, positing that they are best understood within cultural, historical, and institutional contexts. More specifically, we adopted mediated discourse (Norris & Jones, 2005; Scollon, 1998) as a theoretical framework to guide and inform data collection and analysis.

In his development of mediated discourse, Scollon synthesized several important strands of research and theoretical thinking, including mediated action (e.g., Wertsch, 1998), sites of engagement (e.g., Scollon, 1998), and communities of practice (e.g., Lave & Wenger, 1991), to

create a unified “interactional sociolinguistic” perspective for understanding the dynamics and patterns of social interaction. This synthesized framework, which has since been further developed by Norris and others (e.g., Norris, 2011; Norris & Jones, 2005), identifies human action within specific contexts as the critical unit of analysis; highlights the negotiation of roles and situation definitions as a defining characteristic of human social interaction and a prerequisite for the communication of information and the accomplishment of shared goals; and calls attention to the mediational means or cultural tools used by individuals during interaction to construct and negotiate roles and situation definitions and develop shared meaning with other individuals (Norris & Jones, 2005; Scollon, 1998).

Cultural tools, which are central to mediated discourse, are defined as the physical and psychological objects or instruments that individuals use to carry out their actions (Norris & Jones, 2005; Wertsch, 1998). For example, as Wertsch described, a pole vaulter uses the tool of a pole, with its long history within sports and society, to accomplish the complicated task of vaulting over a bar. Similarly, individuals regularly use the nuances of spoken speech to communicate information and accomplish a variety of goals during social interactions. As these examples illustrate, cultural tools are both symbolic, such as language, written text, gestures, procedures, and styles of speech, as well as physical, such as computers, clothing, or interactive exhibits (Rowe, 2005; Wertsch, 1998). In both cases, however, they draw their meaning and significance as concrete instances of common and accepted cultural practices within specific communities and social contexts (Norris & Jones, 2005). The action of standing in front of a group of students in a classroom, for instance, is associated with authority and expertise because of the broadly understood practice of teaching within the particular context of formal schooling.

A central focus of mediated discourse research has been to understand how individuals appropriate cultural tools to negotiate roles and identities during social interactions and how these tools afford and constrain the negotiation process (Norris, 2011; Norris & Jones, 2005). Building on the example above, a museum educator can be said to appropriate a culturally-recognized teaching strategy by standing in front of a group of visitors like a classroom teacher, thus communicating the role of a knowledgeable and authoritative expert and affording the educator a degree of control over the learning event. More broadly, any of the many teaching strategies used by museum educators and visitors are, from a mediated discourse perspective, examples of individuals appropriating cultural tools associated with teaching and learning to accomplish specific actions, such as communicating scientific ideas and processes, that may require negotiating roles and identities.

In this study, the mediated discourse framework guided our analysis and focused our attention on particular aspects of the video data, including evidence of the negotiation of roles and situation definitions and the linguistic and cultural tools used by staff and family members during those negotiations. Focusing on mediated action and how individuals use cultural tools during discourse allows the analysis to encompass both individual action and the social, cultural, and historical contexts shaping that action, as exemplified through cultural tools (Wertsch, 1998). The framework also draws attention to the fundamental processes of social interaction that are arguably critical to staff-mediated learning in museums, even though they may be overlooked in favor of discourse content or teaching strategies specific to that content. In particular, a mediated discourse perspective emphasizes that cultural tools are used to negotiate roles, identities, power, and authority, all of which ultimately have profound implications for learning and education (e.g., Apple, 1992; Barton, 1998).

## **Research Questions**

Informed by research on human social interaction and the theoretical framework of mediated discourse, three broad research questions guided the study:

1. What is the nature of unstructured interactions between museum staff and family groups in science centers?
2. How do staff members and family groups initiate unstructured interactions in these settings?
3. How do families and staff negotiate roles and goals during unstructured interactions in these settings?

Given the lack of research on unstructured staff-family interactions, our investigation of these questions was necessarily descriptive and exploratory. Our intent was to balance the need to both describe unstructured staff-family interactions broadly and begin to develop a theoretical understanding of the characteristics and processes underlying these interactions, as well as focus specifically on the aspects highlighted by our theoretical framework and research on human social interaction. We specifically targeted families because they represent a critical audience for science museums (Dierking & Falk, 1994; Ellenbogen, Luke, & Dierking, 2007).

## **Method**

To explore the social dynamics of unstructured staff-family interactions at the Oregon Museum of Science and Industry (OMSI), Portland, OR, we used a qualitative research approach, collecting data through naturalistic observation, including videotaping and field notes. Qualitative research is inductive and exploratory, emphasizes the importance of context and setting, and often focuses on developing a deep understanding of individual lived experience or complex social phenomena (Marshall & Rossman, 2006). The approach lends itself to initial

investigations of unexplored areas of research, such as staff-visitor interactions in museums (Tran, 2007).

### **Research Context**

We collected video and audio data of families interacting with educators in the Physics and Chemistry Labs at OMSI. The two locations were chosen to enable comparisons across settings, strengthen the transferability of study findings, and maximize variation in staff-family interactions (Marshall & Rossman, 2006). Prior research has suggested that physical context can influence informal science learning in general (Falk & Dierking, 2000; NRC, 2009) and interactions between staff and families in particular (Mony & Heimlich, 2008). From a mediated discourse perspective, we suspected that these two settings might offer educators and staff members' different cultural tools for negotiating roles and situation definitions.

Both learning labs offer visitors opportunities to engage deeply with scientific activities and phenomena and are specifically designed to support structured and unstructured staff-visitor interactions. The labs are always staffed with museum educators and interactions between staff and families are common. The Chemistry Lab is organized around a long laboratory table, with individual activity stations for families and space at the opposite side of the table for staff to move back and forth, offering guidance and suggestions. The Physics Lab has a small activity table but also includes many freestanding interactive exhibits, similar to other areas of the museum.

To capture a diversity of staff-visitor interactions, we collected data at four separate exhibits and table-top activities within the two labs, all of which were recommended by lead educators because they were popular with both visitors and staff and had the potential to foster rich staff-family interactions. In addition, when selecting activities, we considered the feasibility

of videotaping and capturing quality audio recordings. In the Physics Lab, we chose the *Musical Glasses* activity, which allows visitors to make music with a set of water-filled glasses, and the *Van de Graaff Generator*, where visitors turn a crank to generate static electricity. In the Chemistry Lab, we selected two experiment stations, *Styrofoam Peanuts* and *Jelly Beads*. At the *Styrofoam Peanuts* experiment, visitors compare how well Styrofoam packing peanuts, "biofoam" peanuts, and ordinary popped popcorn dissolve in water. At the *Jelly Beads* experiment, which is part of a food chemistry unit, visitors use a common thickening agent to create small, jelly-like beads. Although all four activities are designed to stand alone or be facilitated by museum educators, the *Styrofoam Peanuts* instructions specifically prompt visitors to ask a staff member to demonstrate how Styrofoam can be dissolved chemically.

### **Research Participants**

The study included OMSI visitors and museum educators. Because we were exploring the natural, spontaneous social dynamics of staff-visitor interactions, participants were not actively recruited. All visitors who interacted with staff members at selected activities were videotaped. However, only families, defined as intergenerational groups that included at least one visitor over and one under the age of 18, were included in the final analysis. Age was estimated during video editing. To minimize the effects of cueing, we followed the "posted sign method" of implied consent procedures outlined by Gutwill (2003). Bilingual, Spanish and English, signs were posted at the museum entrance and the entrance to the labs, informing visitors that videotaping was in progress. A smaller sign was also attached to the specific activity or exhibit being observed. Although visitors noticed the signage, it did not appear to affect their behavior or their interactions with staff members.

All OMSI educators over the age of 18 were eligible to participate and the final sample included staff members with a range of backgrounds, experience levels, and facilitation approaches. Some had worked at OMSI for less than a year and were still becoming familiar with how to engage visitors. Others had worked at the museum for many years, were highly experienced facilitating interactions with visitors, and had developed many of the activities in the labs. On the day of videotaping, all OMSI staff and volunteers working in the area were informed of the videotaping procedures and all agreed to participate in the study.<sup>2</sup>

### **Data Collection**

We collected data over the course of four days between May 30 and June 6, 2010. Each activity was videotaped for one day, beginning when the lab opened and ending after a variety of interactions had been captured for each museum educator scheduled to work that day. In a few cases, the same staff member was videotaped at multiple activities. Fewer interactions were videotaped in the Chemistry Lab because the museum was relatively slow during the scheduled observations, probably due to the weather. During videotaping, the camera was set up in an unobtrusive location so as not to interfere with the interactions but still be clearly visible to visitors. A directional microphone was positioned between the activity and the camera station. Although we did not operate the camera during videotaping to avoid influencing visitor behavior (Barron, 2007), the first author was present to collect field notes, which were transcribed within 24 hours.

### **Data Analysis**

To analyze the video data, we used an inductive, qualitative approach, drawing from constructivist grounded theory (Charmaz, 2006). We carefully reviewed the tapes and selected

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<sup>2</sup> All recruitment and informed consent procedures were reviewed and approved by the Oregon State University Institutional Review Board.

staff-visitor interactions for analysis that included verbal communication between staff and families, excluding interactions with adult-only and children-only groups. Using Final Cut Pro,<sup>TM</sup> we created separate video segments for all eligible interactions. Each segment began when the first family member appeared on camera and ended when the last family member exited. In total, the four days of videotaping yielded 65 eligible interactions, with each segment representing a unique family group. Fifty of these interactions were in the Physics Lab and 15 were in the Chemistry Lab. All segments were exported as QuickTime<sup>TM</sup> videos and transcribed by an OMSI staff member using InqScribe.<sup>TM</sup>

Following Charmaz (2006), analysis was conducted in three phases: initial coding, focused coding, and interpretation. During initial coding, we reviewed all 65 video segments and assigned short, low inference codes line by line to the transcriptions, focusing on preserving the essence of visitor and staff actions and utterances. Coding during this stage, and throughout the process, was informed, but not limited or predefined, by our theoretical perspective and “sensitizing concepts” (Blumer, 1969) from the social interaction literature, including opening sequences, interactional roles, role negotiation, mediational means, situation definitions, and power and expertise.

Next, based on the relative frequency of initial codes, as well as the sensitizing concepts described above, we identified and defined a set of focused codes and used these to recode the interactions, continuing to refine code definitions throughout the process. For example, a variety of initial codes connected with the ways adult visitors reacted when staff members were demonstrating or providing explanations were refined and collapsed into three focused codes: restating, answering/expressing emotion for the group, and managing the group. Because initial coding suggested distinct differences in the types of staff-visitor interactions by location, as well



as by individual staff member, we selected a subset of the video segments for focused coding. Given that there were so few interactions in the Chemistry Lab, all of these segments were included in the final analysis. In the Physics Lab, we used a random stratified sampling approach to select 18 interactions that equally represented the *Musical Glasses* and *Van de Graaff Generator* activities and the six Physics Lab educators included in data collection. Before these segments were recoded, the second author, who had not been directly involved in initial coding, carefully reviewed the coding scheme and suggested revisions.

Finally, during the interpretation phase, we made within and between segment comparisons, sorted segments based on the focused coding, and searched for explanations and processes to draw connections between the codes and develop code categories (Charmaz, 2006). Guided by the relative frequency of focused codes and the relations among codes, we moved from coded data segments to broader, more theoretical statements about patterns and processes highlighted by the coding. The focused codes described above, for example, were grouped into a broader category, “co-facilitating,” and theoretical connected to several other code categories, such as “demonstrating prior knowledge,” focused on the strategies adult visitors used to maintain strong roles during interactions with staff members. Throughout the process, we wrote descriptive and interpretive memos to capture the essence of codes and code categories, describe emergent themes and patterns, and make our interpretive process explicit. To challenge and test our interpretations, we used the “constant comparative method” (Charmaz, 2006; Glaser & Strauss, 1967), making comparisons within and between video segments, as well as searching for alternative understandings and explanations (Charmaz, 2006; Marshall & Rossman, 2006).

Early in the analysis, it became apparent that social dynamics between staff and adult visitors were critical for defining the nature of the encounters. Therefore, subsequent coding and

analysis focused particularly on interactions between adult family members and staff. Following Morgan (1993), in the results section below we use code frequencies, based on the number of interactions in which a focused code appeared at least once, to make explicit how different patterns of engagement informed our analysis and guided our theoretical interpretations.

### Results

In total, 33 segments were purposefully selected for focused coding, including 18 from the Physics Lab (nine at *Musical Glasses* and nine at the *Van de Graaff*) and 15 from the Chemistry Lab (seven at *Styrofoam Peanuts* and eight at *Jelly Beads*). The final sample of clips included 33 unique family groups, representing a total of 87 individuals, and 13 different staff members, including a broad range of ages, backgrounds, and experience levels. Twenty-one interactions were with paid staff and 12 were with volunteers. Visitor group size ranged between two and four individuals, with an average of 2.6 visitors per group. Just over half of the families (55%) were composed of one adult and one child, although family groups may have included additional visitors who were not captured on video. Both men and women were well represented in the sample: 16 groups included men, 23 included women, 28 included girls, and 19 included boys. The total time families spent at the activities ranged from 0.8 to 12.3 min, with an average of 5.5 min and a median of 4.9 min. In almost every case, interactions with staff represented only a portion of the total time families spent at the activities.

Utilizing a mediated discourse perspective, and paying particular attention to cultural tools used by families to negotiate roles and situation definitions, we identified three emergent themes through our inductive analysis: (1) interactions were characterized by distinct phases of role and goal negotiation during which adults and staff members used a variety of cultural tools drawn from everyday and museum-specific practices; (2) adults acted as gatekeepers to staff

involvement, either supporting or contesting staff members' potential roles as facilitators of the family learning experience; and (3) physical and social context shaped the nature of the interactions by providing different cultural tools for staff and family members, making conventionalized roles more or less salient and affording or constraining social practices.

### **Phases of Role and Goal Negotiation**

Close analysis of the video revealed the complexities of staff-family interactions and highlighted the strong role negotiation patterns present throughout. Three critical phases of role negotiation emerged: (1) initiating the interaction, (2) facilitating learning, and (3) introducing new goals. During each of these phases, we observed staff and family members using a variety of cultural tools, drawn from social practices appropriate in both everyday settings and, especially, museum contexts, to assert, support, and contest roles and to negotiate changing situation definitions aligned with family or staff goals.

**Initiating the interaction.** Because unstructured interactions are by their very nature impromptu and opportunistic, staff and family members must attempt to establish new roles relative to each other where none existed previously. The majority of interactions in the study (28 examples) were initiated by staff, with only five visitor-initiated examples, suggesting that families may not arrive at OMSI's learning labs with a strong expectation of interacting with staff members. During the initiation phase, staff used a variety of cultural tools to engage with visitors, including greeting visitors, inviting visitors to participate in the activity, asking a check-in question (e.g., "how's it going over here?"), offering visitors guidance or tips (e.g., "actually, you want to first pour this out into the beaker and then add that to the beaker"), or physically inserting themselves into family interaction without an explicit, verbal initiation strategy. The most common staff initiation strategy was asking a check-in question (10 examples), followed by

inviting visitors to participate (six examples), inserting themselves into ongoing interactions (six examples), and offering suggestions or guidance (five examples). Surprisingly, there were only two examples of staff explicitly greeting visitors, suggesting that staff members in OMSI's learning labs may often assume they have a predefined role relative to visitors.

Role negotiation between staff and families during this phase was most evident in the ways that adult family members responded to staff initiation. In 18 of the interactions, we identified clear and consistent patterns of adult responses, based on verbal cues and eye contact, which appeared to communicate different degrees of willingness to include staff members in the family interactions. At the outset of nine of the interactions, adult family members fully acknowledged staff initiation with both a verbal and non-verbal response. For example, if a staff member initiated with a check-in question, one of the adults might look up, smile, and politely respond to the question. In nine other examples, visitors either partially acknowledged staff members, by providing only a verbal or only a non-verbal response, such as answering a staff member's question but not making eye contact, or completely ignored staff members.

Table 1 describes a representative example of a staff member initiating an interaction and the adult family member fully acknowledging that initiation. The family in the Physics Lab was initially confused about how to begin the *Musical Glasses* activity (lines 1-5). However, the woman seemed to feel that it would be interesting to the girl and tried to engage her (line 6), despite being unsure about how to begin. When the staff member arrived, the woman made a subtle hand gesture indicating that the staff should help the girl (line 7) and soon afterwards, not so subtly encouraged the staff member to participate (lines 9-11). At that point, the woman actually dropped out of the interaction and let the staff member take the lead in orienting and guiding the girl.

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There were also examples in which the adult response to staff initiation was less clear or consistent. In nine of these cases, interactions were either initiated by the visitors or staff members were able to bypass the initiation phase, suggesting that the context of the initiation, as discussed below, can make role negotiation during the initiation phase more or less salient. The remaining six interactions included multiple types of adult responses to staff initiation. In the majority of these cases (five of six), staff started by offering guidance after noticing visitors were having trouble and, despite adults initially ignoring or only partially acknowledging these offers, persisted and were later able to successfully reinstate the interaction.

**Facilitating learning.** Regardless of how the interactions began, when staff members moved beyond initiation and began engaging with families around the lab activities, the facilitation of family learning became an active site of role negotiation. Adult visitors were highly involved in facilitating the activity for the group, even after the arrival of staff. In fact, in only one example did adults become completely disengaged and relinquish all control to the staff member. Adults either continued to facilitate learning directly in parallel with staff or played supporting roles as co-facilitators. Staff-visitor interactions also included frequent examples of staff and adult visitors asserting their knowledge and expertise.

Staff and adult family members used similar sets of facilitation and teaching practices to guide family learning. Common cultural tools drawn from these practices included checking in, guiding or directing, interpreting, focusing attention, modeling, demonstrating, and encouraging, all of which embody leadership, expertise, and authority. For adult visitors, the most common

strategies were guiding or directing (15 interactions), interpreting (13 interactions), encouraging (6 interactions), and checking in with other visitors, usually their children (5 interactions).

Similarly, the most common strategies for educators were guiding or directing (23 interactions), demonstrating (8 interactions), focusing attention (6 interactions), and modeling (5 interactions).

The relatively similar frequency at which staff and adult family members used these practices was a strong indicator that not only staff members but also adult visitors were adept at using these types of cultural tools to maintain leadership roles during the interactions.

Our analysis also suggested that adult family members engaged in several unique practices, tied both to everyday conversational norms and parent-specific behaviors, as they negotiated leadership roles while facilitating family learning with staff members. First, adult family members asserted their unique position within the interactions by drawing on commonly understood parenting practices and acting as representatives for the family group, including talking or answering for the group, restating staff comments or suggestions, and playing a parental role by managing family members. When talking or answering for the group, adults assumed the role of representative for the family and took responsibility for responding to staff questions, expressing emotion for the group ("Wow, that's amazing"), or showing appreciation for staff ("Isn't that cool? Thank you very much."). Although adults often seemed genuinely interested and engaged, it was also clear from their tone and body language, including adopting a more theatrical voice and shifting their gaze between family and staff members, that they were going beyond expressing individual interests or responses. When restating staff comments, adults sometimes seemed to be responding to their children's hesitation to follow staff members' suggestions. In other cases, however, restating appeared to serve as a way for adults to maintain their presence or leadership role in the interactions.

Second, adult visitors maintained their roles by directly asserting their knowledge and expertise. One important set of cultural tools, facilitating group learning, was described previously. By being actively involved in facilitating or co-facilitating learning, adults projected an identity as confident, knowledgeable, and able teachers. Visitors also shared their knowledge and experience through stories and anecdotes, answering knowingly to staff comments, and even finishing staff sentences. Each of these sets of practices appeared to be commonly understood cues for communicating to staff members that adult visitors possessed background knowledge and experiences that should be valued within the context of the interaction.

As an example, Table 2 describes an adult demonstrating his knowledge and expertise at the *Styrofoam Peanuts* experiment in the Chemistry Lab. The man and boy had finished the experiment and, prompted by the instructions, asked the staff member to demonstrate how a Styrofoam peanut can be dissolved. Although both the man and the staff member were extremely polite, the man continually asserted his knowledge and expertise by answering knowingly (lines 2, 6), sharing his background knowledge (lines 6, 8, 10, 18), and anticipating staff comments (lines 14, 18, 20). The man also used several facilitation and co-facilitation strategies, including answering for the group (line 4) and interpreting (line 10).

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Insert Table 2 About Here

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**Introducing new goals.** A third phase of role negotiation that emerged from the study occurred when staff members introduced a new learning goal during the interaction, often focused on discussing the scientific content of the activity. Although both visitors and staff introduced new goals, or situation definitions, it was a much more common strategy for staff (19

of the 33 interactions) compared to visitors (7 of the 33 interactions). When introducing a new goal, staff attempted to shift, at least temporarily, the overall purpose and focus of the activity. Often, staff members introduced a new goal of understanding the science behind the activity or relating the activity to visitors' everyday lives, in contrast to simply completing or being successful at the task. Less frequently, staff introduced engagement goals, such as encouraging family members to adopt a more exploratory (or, in some cases, a more structured) way of interacting with the activity. For example, staff members sometimes encouraged families in the Chemistry Lab to explore the phenomenon or materials, rather than strictly follow directions.

As with staff initiation, adults used common cultural practices associated with everyday conversations to either support or inhibit staff members' attempts to introduce new learning goals. In some cases, adult visitors fully supported new staff goals by both acknowledging the new goal and actively pursuing it. In other cases, adults either verbally or nonverbally acknowledged that staff members had introduced a new goal but did not actively pursue it or encourage other family members to do so. Finally, some adults simply ignored the new goal. The study included nine examples of visitors fully supporting new staff goals, seven examples of visitors only partially supporting or ignoring staff goals, and two examples of visitors both supporting and ignoring staff goals within the same interaction. Didactic staff goals, defined as learning goals focused on communicating scientific content, were more common but less likely to be fully supported (four out of twelve examples) compared to engagement goals, which focused on how the families interacted with the activities (five out of eight examples).

Table 3 shows an example of an adult contesting the new learning goal introduced by the staff member. A man and boy were playing with the glasses when a staff member arrived and tried to introduce a more structured goal of using the sheet music to play a song (lines 20-22).



The man, however, indicated that the boy was not interested in playing music (lines 21-24). In this example, the staff member tried to introduce an engagement goal (albeit, a highly structured engagement goal). This example and others suggest that one reason adults did not support or only partially supported new staff goals was because younger family members were not interested or engaged.

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Insert Table 3 About Here

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### **Adult Family Members as Gatekeepers**

Our analysis also suggested that adult visitors played an important role in shaping staff-family interactions by acting as gatekeepers to staff initiation and the introduction of staff learning goals and by continuing to facilitate group learning even when staff members were present. Although role negotiation occurred throughout interactions between staff and visitors, the opening phase of the interactions appeared to be critical for shaping the relationships between staff and families. In particular, how adult visitors responded to staff initiation, as discussed above, helped set the tone for the encounter. In the nine cases in which adult visitors ignored or only partially acknowledged initiation attempts by staff, subsequent interactions were usually brief or characterized by ongoing negotiation of roles and expertise between staff and adults. In these cases, it was difficult for staff members to guide family learning, introduce new learning goals, or establish more than a superficial connection with families. Notably, none of these interactions led to in-depth, prolonged staff engagement.

A typical example is described in Table 4. A man and a boy approached the *Musical Glasses* activity before the staff member arrived. The man clearly understood the activity and

began by demonstrating for the boy (lines 1-3). Soon after, a staff member approached and inserted himself into the interaction, acknowledging the man's success (line 4). However, rather than look up or respond, the man continued to guide and interpret the experience for the boy (lines 5-18). Throughout, he used a variety of cultural tools, including asserting his prior knowledge of the activity and the underlying phenomenon, to maintain his leadership role (e.g., lines 5, 8, 12, 14). Although the staff member continued to try to support the boy, his relationship with the man was ambiguous and uncomfortable. Later, the staff member directly contradicted the man (lines 18-19), providing correct scientific information but seemingly further straining the relationship with the adult. The family left a few minutes later.

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Insert Table 4 About Here

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Similarly, when staff members tried to introduce new learning goals, adult visitors often determined the success of those attempts. Without adult support, families rarely pursued new staff goals and adult visitors were quick to recognize and respond when staff goals were not congruent with family interests. A typical example of an adult using his role and authority as a parent to block a new staff learning goal is described above in Table 3. By contrast, Table 5 shows a relatively rare example of an adult supporting a new staff goal. For most of the activity, the woman was focused on following the instructions and completing the experiment. However, in line 13, the staff member introduced a new goal, suggesting a more exploratory way of engaging with the experiment. The woman supported this goal by following up and reinforcing the staff member's suggestion (lines 14-16). Interestingly, as in many other examples, the women continued to refer to the instructions, rather than take cues from the staff member, and in a few

minutes she returned to the goal of completing the experiment (line 20). Even though the staff member had introduced a new goal, the woman maintained a strong leadership role by restating, guiding and directing, interpreting, and using the instructional text as a cultural tool to claim authority.

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Insert Table 5 About Here

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### **Physical and Social Context Shape Interactions**

The staff-family interactions in our study also highlighted ways that the social context of the interactions and the physical environment provided families different cultural tools, each with different affordances and constraints, with which to negotiate roles and goals with staff. For example, Chemistry Lab activity instructions allowed adult visitors to claim more authority and leadership during interactions. Adults often used the instructions as a tool for shifting the focus of the interaction back to completing the activity, as seen in Table 5. This shift also implied a stronger role for adults and a less central (or nonexistent) role for staff. The physical setup of the Chemistry Lab, where families sat on stools at the experiment stations while staff stood at the opposite side of the counter, also allowed families to clearly define their interactional space. By contrast, the lack of instructions and defined activity stations in the Physics Lab gave staff more authority and more exclusive ownership over facilitating activities.

These different physical contexts afforded different staff initiation strategies and different outcomes during initiation. In the Chemistry Lab, asking check-in questions was a natural role for staff members as they moved behind the counter, monitoring visitor groups. Similarly, four out of the five instances of offering guidance happened in the Chemistry Lab. In contrast,

inviting visitors to participate only occurred in the Physics Lab, when staff members were stationed at a standalone exhibit or table top activity. Seven out of the eight examples of staff beginning at the activity when visitors arrived occurred in this setting. Ignoring or only partially acknowledging staff initiation strategies was least common at the *Styrofoam Peanuts* experiment (two out of seven) and the *Van de Graaff* Generator exhibit (two out of nine), both of which afforded staff more opportunities to establish their roles in ways that did not threaten adult visitors' roles. In contrast, at the Chemistry Lab's *Jelly Beads* experiment, set up as a self-contained activity for families, visitors ignored or only partially acknowledged staff members in seven out of eight interactions. The physical set-up of the different activities may allow adult visitors and staff members to adopt, or to be perceived as adopting, more or less conventionalized roles, which may in turn influence facilitation strategies and interaction outcomes.

The social context also appeared to afford and constrain the ways families could use cultural tools to negotiate roles and goals. This was particularly clear when analyzing the nine examples of successful staff initiation. In the four cases of successful initiation in the Physics Lab, families had not been able to successfully interact with the exhibit before the arrival of staff. For example, some parents were having trouble motivating children to interact with the *Van de Graaff Generator*. When staff did initiate an interaction, either by inserting themselves or using another initiation strategy, adults were very willing to support the staff members' role. In the Chemistry Lab, examples of visitors fully acknowledging staff initiation included a woman who clearly needed help with her goggles and an instance in which a staff member asked if the family needed help and an adult politely replied that they were doing fine. Because the adult in the

second case communicated an expectation of continuing to work without staff help, and the staff member respected this expectation, the interaction ended despite a successful initiation.

In some cases, the social context allowed staff members to establish connections with families without negotiating roles. In 9 of the 33 interactions, we observed no explicit adult response to staff initiation. This dynamic was common in the Physics Lab, especially at the *Van de Graaff Generator* exhibit, when staff started at the activity and invited children in the group to participate. In these cases, the adults arrived later, after the children had engaged with the activity. Although adults still found ways to play a strong role in the interactions, the situation allowed staff to clearly establish their role as primary facilitator, aligned with conventionalized expectations of teaching. Furthermore, it appeared that because they entered later, adults had no reason to feel that staff members had intruded. In the Chemistry Lab, interactions without an adult response to staff initiation only occurred at the *Styrofoam Peanuts* activity, likely due to the unique prompt in the instructions for staff participation. Because families asked staff members to participate, there was no need for staff to use initiation strategies or for adults to manage the involvement of staff.

Notably, some of the longest, most in-depth staff-visitor interactions occurred in these situations, when staff members entered the interactions with clear, and even potentially conventionalized, roles and families and staff members were able to bypass the initiation phase altogether. For example, in Table 2 (above), even though the man continued to assert his knowledge and expertise throughout the interaction, he nonetheless supported the staff member's goal of demonstrating and explaining the chemistry of dissolving Styrofoam. Because the adult, prompted by the activity text, invited the staff member to participate, the staff member's role was

clear from the beginning and the man was likely much more willing to support an extended engagement.

### **Discussion**

The goal of this study was to explore the nature of unstructured interactions between museum staff and family groups in a science center, including the cultural tools that staff and families employ to initiate interactions and negotiate roles and situation definitions. We found that encounters between family groups and staff in the study were characterized by the ongoing negotiation of roles and situation definitions, aligned with research on everyday social interaction (Goffman, 1959, 1967; Schegloff, 1986; Scollon, 1998), as well as family learning in museums (Ash, 2002, 2003, 2004a, 2004b; Rowe, 2005). Through in-depth, inductive analysis of the video segments, we developed a framework to describe unstructured staff-family interactions, highlighting three phases of role negotiation: initiation, facilitation, and the introduction of new learning goals. Mediated discourse proved to be a powerful theoretical perspective for understanding these interactions, highlighting the cultural tools—including conversational conventions, body language, exhibit signage, assertion of prior knowledge and experience, and parental authority—that staff and families used to negotiate interactional roles, define situations, and assert and contest power and expertise.

During initiation, staff members attempted to engage the family and become participants within an existing community of practice (Lave & Wenger, 1991; Wenger, 1998). Families reacted to these attempts in a variety of ways but were often reluctant to fully acknowledge the staff members' new role. Regardless of the outcome of the initiation phase, both staff members and adult visitors were often highly involved in facilitating group learning, appropriating cultural tools from both the practices of teaching and parenting. Adult visitors defined their roles in

relation to staff members, facilitating in parallel with staff, supporting staff by co-facilitating, or ignoring or resisting staff efforts. Throughout this process, staff members often tried to introduce new learning goals and shift the focus of the activity. Families, in turn, used a variety of cultural tools to either support or contest staff goals.

During each of these phases, the negotiation of roles and situation definitions was closely linked. For example, in initiating an interaction, staff members often used cultural tools to communicate a situation definition in which they claimed principal power and expertise for facilitation. However, as evidenced by the frequency of unsuccessful initiation attempts, adults within family groups often resisted this situation definition and worked to preserve the existing social dynamics. In many cases, adults did not completely ignore staff members, but rather partially acknowledged their initiation or introduction of new learning goals by either responding verbally without looking at the staff members or looking but not responding. These cultural tools arguably represent commonly understood practices of everyday conversations, guided by shared norms and rules concerning when it is polite to continue a conversation with a stranger and the types of physical and verbal cues that signal a willingness or unwillingness to engage in a conversation. In particular, partial acknowledgment may be a socially acceptable way to politely communicate to staff that their help and involvement are not needed. In this study, the nature of staff-family interactions appeared to be similar whether adults ignored or only partially acknowledged staff members.

Although role negotiation occurred throughout interactions between staff and visitors, the opening phase of interactions was important for shaping subsequent relationships between staff and family groups, as in other types of social encounters (Gumperz & Hymes, 1972; Kendon, 1990; Schegloff, 1986; Scollon, 1998). In particular, how adult visitors responded to staff

initiation helped set the tone for the encounter. Although we did not examine outcomes of staff-family interactions, findings suggest that unless staff members can successfully initiate interactions with visitors and establish stable roles, there is little opportunity for them to influence family learning.

### **Adult Family Members**

Findings highlighting the importance of adult family members are not surprising given research demonstrating the significant roles that adult visitors often play as mediators of family learning in museums (Crowley et al., 2001; Crowley & Jacobs, 2002; Crowley & Palmquist, 2007; Fender & Crowley, 2007; Gleason & Schauble, 2000; Rogoff et al., 2003; Schauble et al., 2002). One important outcome of this study is to provide evidence that adult roles extend into interactions with staff members, at least within the context of unstructured interactions. It is reasonable to expect that adult visitors who are mediating family learning are likely to continue this role even when staff members are present. Research has shown that adult visitors to museums arrive with identity-related visit motivations and that these identities shape the nature and outcomes of the visit (Falk, 2006, 2009; Falk, Heimlich, & Bronnenkant, 2008). In science centers, visitors identified as "facilitators" by Falk and his colleagues are primarily motivated by their perceptions of museums as places to support the learning of other group members. From a mediated discourse perspective, interactions with staff members represent another opportunity for adults to reinforce their identities as group facilitators. As this study suggests, adults may often work to negotiate roles and situation definitions that are congruent with their facilitator identities and may contest situation definitions that undermine their power and expertise.

### **Physical and Social Context**



Our study also provided evidence that the social and physical context influences the nature of unstructured staff-visitor interactions. As suggested by the social interaction literature, the physical set-up of the learning labs and activity stations and the social nature of the encounters between staff and adult visitors helped determine whether interactional roles were ambiguous or conventionalized. In general, as George (2008) found with personal trainers and other expert service workers, interactional roles between educators and adult family members were often ambiguously defined, leading to unpredictable interactions and an ongoing tension between institutional goals, as represented by museum staff members, and the everyday rules, rituals, and customs of social discourse. Although research has suggested that role negotiation is critical during the opening sequences of social interactions, staff members and adult visitors often continued to contest and assert interactional roles throughout the encounters. There was a natural tension as staff members attempted to support visitor learning and adult visitors worked to maintain their roles as facilitators within the families.

In a few cases, we observed that staff roles were clearly defined from the beginning, either because staff were at the activity when visitors arrived (e.g., the *Van de Graaff Generator* exhibit) or visitors were prompted to ask for staff involvement by activity instructions (e.g., the *Styrofoam Peanuts* experiment). As noted above, these interactions were some of the longest and most in depth staff-mediated experiences observed. From a social interaction perspective, visitors and staff were able to attend to the topic of the interaction because relationships and identities had been successfully established (Scollon, 1998). There were also some cases of relatively brief interactions in which both staff and families seemed satisfied, such as staff members offering a brief tip or piece of advice, visitors exploring an activity briefly and then moving on, or staff performing a quick demonstration. Again, the success of these interactions

may have been possible because the role of staff, although small, was clearly defined and aligned with conventionalized role expectations. Clearly defining roles appeared to help staff and visitors navigate the social challenges associated with unstructured staff-facilitated interactions.

These findings offer an alternative explanation for why Mony and Heimlich (2008) observed that the number of educational messages communicated by staff members during interactions with families was related to the physical context. The authors speculated that some exhibits may have generated higher visitor interest or been more relevant to key educational messages. Alternatively, these exhibition areas may have provided more affordances for staff members to establish clear relationships with families, allowing staff members to guide interactions and introduce new messages and learning goals.

### **Implications for Museum Educators**

Focusing on the social dynamics of staff-mediated learning offers museum educators a new lens to understand their work and develop effective facilitation strategies. The rules and patterns that govern social interaction are complex, particularly when roles and situation definitions are not clearly defined. In this study, in the context of OMSI's learning labs, unstructured interactions were extremely challenging for staff members to initiate and facilitate. In addition, the physical context of the labs shaped and constrained the nature of the interactions, often limiting staff members' ability to effectively engage families.

It is important to note that the sample size for this study was small. However, if the data are at all representative of unstructured interactions at other museums and science centers, findings suggest that successfully supporting family learning requires unique staff facilitation strategies, skill sets, and expertise. Rather than using the didactic approaches of traditional classrooms, as is commonly observed in prior research (Cox-Peterson et al., 2003; Tal & Morag,

2007), staff interpreters should explore strategies that capitalize on the unique social dynamics of unstructured interactions and tailor facilitation strategies to the variety of situation definitions and physical contexts that characterize these encounters. For example, staff facilitation will, by necessity, require different strategies when a staff member invites a family to participate in an activity than when a staff member approaches a family that has already spent time together at an exhibit. By carefully considering the influence of social and physical context and learning how to observe and respond to family social dynamics, museum educators can develop a repertoire of approaches for different situations and will be better prepared to determine when and how to effectively facilitate family learning. In addition, staff members should understand and appreciate the important role that many adults play in mediating family learning and remain aware of their own roles in relationship to those adults. One promising strategy, currently being explored at OMSI (Pattison, 2011; Pattison & Dierking, 2012), is to support the facilitation that adult visitors are already providing for families. These research-based perspectives on practice are critical to supporting training for museum educators and other informal learning professionals (Tran, 2008).

Museums can also support educators by considering staff when designing exhibitions and learning labs. Findings suggest that the physical design of a learning space may be as important in influencing the nature and outcomes of staff-family interactions as the facilitation strategies that staff members use. By considering the design of these settings, institutions can support the success of front-line staff. However, doing so requires clearly articulating institutional goals for the visitor experience. Implications for design depend on the degree to which an institution supports visitor-oriented experiences, in which staff members play relatively minor roles in supporting learning, or more staff-directed experiences, where educators take a leading role.

### **Directions for Future Research**

Researchers are just beginning to understand staff-mediated learning in museums, and in particular unstructured interactions between staff and visitors. Based on our findings, supported by the social interaction literature, we suggest that role negotiation between staff and adult family members is a critical element of these interactions, particularly during initiation, facilitation, and the introduction of new learning goals.

Future research should explore the extent to which these findings can be transferred to other audiences and learning environments. Although a diversity of staff members participated in this study, all of the educators were influenced by the institutional context and culture of OMSI. Staff at other museums may utilize distinctly different approaches to facilitating such interactions. Similarly, different family groups, including those from diverse cultural or socioeconomic backgrounds, may respond to staff facilitation in different ways, perhaps being more or less likely to contest the authority and expertise of educators. Since the cultural tools that families and staff use during unstructured interactions represent specific cultural practices, the nature of these interactions will likely differ across diverse audiences. Although we did not collect demographic data from families, the majority of OMSI visitors are from white, middle class, and English-speaking communities, which have traditionally been disproportionately represented in education and learning research (e.g., NRC, 2009; NRC & IOM, 2000). Researching interactions in different institutions, with a diversity of families, will help broaden our understanding of the many ways families learn in museums.

To ensure the generalizability of research findings, investigators should use a variety of data collection methods and theoretical perspectives. A limitation of this study was the reliance on naturalistic observation. Interviews with families and staff would have provided an additional

and important perspective on staff-mediated family learning in museums. In addition, our methodology focused on observing selected activities. Another approach would be to track families throughout their visit, providing additional insights into the interactive dynamics we observed between and among the social and personal contexts of families and facilitators and the physical contexts of the environments and individual activities.

Future research should also continue to explore the factors that influence the outcomes of these interactions. Quantitative approaches that complement qualitative findings would help identify correlations and causal connections between social dynamics and learning outcomes, defined broadly to include engagement, learning behaviors and conversations, increased knowledge and understanding, visitor satisfaction, and other emergent and long-term impacts. It may be that staff-mediation is particularly well suited to support some types of outcomes but not others.

In summary, a social interaction perspective in general, and mediated discourse in particular, proved a useful theoretical framework for studying staff-mediated learning, particularly unstructured interactions between staff and families. Given the potential frequency of these interactions in free-choice learning institutions around the globe, and the importance of families as an audience for museums and science centers, a better understanding of these interactions, and the facilitation strategies staff can use to successfully support family learning, remains a research priority for the field.

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Table 1

*Visitors Fully Acknowledging Staff Initiation at the Musical Glasses Activity*

Line #	Conversation	Behavior
	<i>(A woman is inspecting the Musical Glasses activity. After a moment, she calls a girl over to join her.)</i>	
1	Girl: What's that?	
2	Woman: It's musical!	
3		<i>The girl walks over and starts inspecting the activity.</i>
4	Girl: What do I do?	
5	Woman: I think you probably use something to... maybe bang on them?	<i>Looking unsure. The girl continues to look at the activity, somewhat confused, then starts to walk away.</i>
6	Woman: Well there's... music!	<i>Pointing at sheets of music, perhaps trying to encourage girl.</i>
7	Staff: Have you done this before?	<i>Approaching from the visitor side of the activity. Woman and girl shake their heads no. Woman points at girl.</i>
8	Staff: Well would you like to?	<i>The girl looks up at the woman, unsure.</i>
9	Woman: Sure!	<i>Nodding her head at staff member and girl, as if giving permission.</i>
10	Staff: Sure? So...	
11	Woman: Yes she would!	<i>Talking to staff, somewhat humorously.</i>
12	Staff: Yes she...? Of course she would! So these are wine glasses, and they're filled with different amounts of water and... have you ever rubbed your finger around a wine glass at home, to make a sound?	<i>Smiling at woman and then beginning to explain activity to girl.</i>
	<i>(The staff member orients the girl to the activity, who then continues to play music for several minutes.)</i>	

Note. Physics Lab, 5/30/10, Tape 1, Group 3, #3.

Table 2

*An Adult Visitor Showing Knowledge and Expertise at the Styrofoam Peanuts Experiment*

Line #	Conversation	Behavior
	<i>(A family has finished the experiment and is prompted by the instructions to ask for a staff demo. A staff member approaches after being signaled by the man.)</i>	
1	Staff: Alright. So we figured out, umm, that water can dissolve the biofoam, huh?	<i>Man looks up as staff approaches. Both man and staff look at partially dissolved biofoam.</i>
2	Man: Yeah, it's not going very quickly, but it'll happen eventually...	<i>Poking at biofoam.</i>
3	Staff: Right. So the question is, how will the Styrofoam get dissolved, right?	<i>The boy looks away, seemingly distracted.</i>
4	Man: That's right.	
5	Staff: Alright. To use the, to get rid of Styrofoam, we'll have to use something a little more intense... umm, do you guys know what acetone is?	
6	Man: Yeah, it's what, uh, Mom uses to take off her nail polish.	<i>Responding to staff but talking to boy.</i>
7	Staff: That's right. So this stuff, if you drop, um, finger nail polish... now, as you might imagine, you really don't want it to be raining acetone. Cause if it's this effective on Styrofoam, think about how it'd do on, like your house's paint job.	<i>Putting a drop of acetone on a Styrofoam peanut in a petri dish. Man and boy watch as the Styrofoam peanut dissolves.</i>
8	Man: Or your skin?	
9	Staff: Yeah.	
10	Man: It's probably not very good for you, if that's what it does to Styrofoam. Do you see that?	<i>Talking to boy.</i>
11	Boy: Yep. It's dissolving so quickly!	
12	Man: Yep. It IS dissolving quickly.	
13	Staff: Ya. So it is a way we can get rid of Styrofoam, but it may not be as, uh...	
14	Man: That doesn't seem very healthy.	
15	Staff: Ya.	
16	Man: So how long does this biofoam take to dissolve?	<i>Poking at half dissolved biofoam.</i>
17	Staff: Um. Actually, it kinda depends on the biofoam. Some of it will dissolve really fast...	
18	Man: That's like the ones that are more like cheese puffs.	<i>Interrupting staff.</i>
19	Staff: Ya. See, those ones, which we would usually use, they go right away...	
20	Man: Those are really fast? Ya. This one's kinda... this one's gonna take an hour or so. <i>(The family interacts with the staff member for several minutes before exiting.)</i>	<i>Talking over staff member.</i>

Note. Chemistry lab, 6/5/10, Tape 1, Group 1, #76.

Table 3

*Adult Visitor Not Supporting a New Staff Goal at the Musical Glasses Activity*

Line #	Conversation	Behavior
	<i>(A man and boy are experimenting with the glasses when a staff member approaches.)</i>	
1	Man: Sounds like a sick cow.	<i>Plane one of the glasses.</i>
2	Staff: You getting a sound? Ya?	<i>Approaching table from visitor side and playing one of the glasses.</i>
3		<i>Man and boy continue playing glasses, ignoring staff.</i>
4	Staff: OK, you can use the tune "Over the Rainbow." That's C, C...	<i>Man watches staff member. Boy continues playing.</i>
5	Man: Ya, I think he just...	
6	Staff: E, B, G...	<i>Modeling playing song.</i>
7	Man: Ya, I think he just wants to hear the...	
8	Staff: He just wants to hear the sounds.	<i>Stepping back from the activity.</i>
9	Man: See, like that right there was used on Dr. Who I think...	<i>Pointing to video screen off camera.</i>
10	Staff: Oh, Really? <i>(Man and staff member continue talking even after boy leaves.)</i>	

Note. Physics lab, 5/30/10, Tape 1, Group 8, #8.

Table 4  
*A Family Group Ignoring Staff Initiation at the Musical Glasses Activity*

Line #	Conversation	Behavior
	<i>(A man and a boy approach the Musical Glasses activity.)</i>	
1	Man: OK. Have you done this before?	<i>Talking to boy.</i>
2	Boy: What?	<i>The man dips his fingers in the water and tries to play unsuccessfully.</i>
3	Boy: What do you do? What's that?	<i>Man manages to make a sound.</i>
4	Staff: There you go!	<i>Approaching activity from behind staff counter. The man does not look up or respond to the staff member.</i>
5	Man: But each size of the glass makes a different sound... the smaller the glass, the higher the pitch.	<i>Talking to boy.</i>
6	Boy: Oh...	<i>Moving to the center of the table and sitting on the stool.</i>
7	Staff: Now you just get your finger wet...	
8	Man: There's people that do this that play music...	<i>Man tries playing two glasses at once. Boy tries to play one of the glasses unsuccessfully.</i>
9	Man: You have to create friction, you have to make it vibrate...	
10	Staff: So you have to push down a bit, you don't have to go fast, but... try to push down more as you go around... There, you're makin' that sound...	<i>Man continues playing glasses without looking at staff.</i>
11	Man: There you go!	
12	Man: You see the water vibrating? You can actually see the water rippling? That's from you, that's from the vibration in the glass.	<i>Pointing at water inside glass.</i>
13		<i>Man and boy are temporarily distracted by the Van de Graaff Generator exhibit in the background. After a few moments, the boy turns back and tries one of the smaller glasses.</i>
14	Man: The smaller ones are harder to do, though...	<i>Looking up briefly at staff member and smiling knowingly.</i>
15	Staff: Yeah, these are a little stiffer, they don't... it's harder to get 'em to vibrate...	
16	Staff: You might have to push a little harder on that one...	<i>Addressing boy.</i>
17	Boy: I think I need more...	<i>Dipping finger in water.</i>
18	Man: You don't want TOO much water, though...	
19	Staff: It shouldn't matter as long as it's wet. The real secret is squeaky clean fingers, so... any kind of oil, hand lotion, soap on your fingers, makes it too slippery...	<i>Man barely smiles and nods at the staff member and continues to play.</i>
	<i>(The staff member greets a new visitor group. A few minutes later, the family leaves.)</i>	

Note. Physics lab, 5/30/10, Tape 3, Group 2, #24.



Table 5

*Staff and Adult Visitors Using a Variety of Facilitation Strategies at the Jelly Beads Activity*

Line #	Conversation	Behavior
	<i>(A woman and girl have been working through the experiment together, with the woman facilitating. A staff member notices that the woman is having trouble with her goggles and steps in to help.)</i>	
1	Staff: Ya, you can just, umm, pop 'em open...	<i>Indicating to the woman how to open the vents in her goggles.</i>
2	Woman: Oh! Thank God!	<i>Smiling at staff and looking relieved as she adjusts her goggles.</i>
3	Staff: You don't have to pull 'em all the way out...	
4	Woman: Just out.	
5	Girl: How do they make beads?	
6	Woman: Isn't that too cool, Willie? Because... of this stuff, right here.	<i>Pointing to the chemical solution in the bottle.</i>
7	Staff: Now take some of this, and rinse those off.	<i>Passing water to girl.</i>
8	Woman: Look there's my phone...	<i>Pulling a cell phone out of her bag. Girl begins rinsing off Jelly Beads and then looks up at staff.</i>
9	Staff: Are they rinsed? Rinse 'em off a little bit more.	
10	Woman: Just, ya. You can, like, spray 'em off. There you go. Look at that... Look at that. That is so cool. OK, Now.	<i>Putting her phone away and directing her attention to the girl.</i>
11	Staff: Make sure you...	<i>Reminding the woman to put her goggles back on.</i>
12	Woman: Put these back on. OK... Oh there we go...	<i>Interrupting and putting her goggles back on.</i>
13	Staff: So... now you can, poke 'em, and pick 'em up, and squeeze 'em and stuff...	<i>Speaking to girl.</i>
14	Woman: So look at that. Leave the rest in the beaker for later.	<i>Reading instructions.</i>
15	Girl: Cool!	
16	Woman: You've rinsed them off... now you can play 'em and roll with 'em in your hand! Oh, that's too cool! What do they feel like, Lily?	
17	Girl: Umm... tapioca!	<i>The woman laughs. The staff nods.</i>
18	Woman: What's the name of the thing, "Jelly Beads"? Huh. Ya. OK... OK.. uh... what can you use 'em for do you think? What do you think they hold?	<i>Continuing to take cues from instructions while the staff member watches and smiles.</i>
19	Girl: Um... this?	<i>Holding up a container of sodium alginate.</i>
20	Woman: Sodium Alginate. Yeah. OK, so now it says, after at least one minute has passed, OK, we have to wait 'til after a minute has passed, then we use the scoop to transfer another one... or two, from the beaker to the petri dish. <i>(Family continues through experiment. Staff watches for a few moments and then leaves.)</i>	<i>Reading instructions.</i>

Note. Chemistry lab, 6/6/10, Tape 2, Group 5, #72.