

An Examination of Fieldtrip Strategies and Their Implementation within a Natural History Museum

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Received 28 March 2005; revised 28 August 2005; accepted 9 September 2005

DOI 10.1002/sce.20117

Published online 27 January 2006 in Wiley InterScience (www.interscience.wiley.com).

ABSTRACT: Although there have been numerous studies examining the impacts of science fieldtrips and the effects of particular instructional practices (such as previsit orientation or postvisit follow-up), few studies have carefully examined the teacher's perspective toward these experiences (Anderson & Zhang, 2003, *Visitor Studies Today*, 6(3), 6–11; Griffin & Symington, 1997, *Science Education*, 81, 763–779; Lucas, 2000, *Science Education*, 84, 524–544; Storksdieck, 2001, *Visitor Studies Today*, 4(1), 8–12). This investigation, part of a larger study aimed at describing teacher agendas for fieldtrips, looks closely at the instructional strategies used by teachers during the fieldtrip itself. Both survey methods and in-depth qualitative methods (interviews, observations) were used to create a categorization of strategies employed by upper elementary teachers from the greater Los Angeles area. Five overarching strategies were identified, including plan of action, structured engagement (such as tours or worksheets), unstructured engagement (such as teacher facilitation), event documentation, and supervision strategies. Suggestions for using this information to support teacher utilization of informal settings such as science centers, as well as ideas for further study, are also discussed. © 2006 Wiley Periodicals, Inc. *Sci Ed* 90:434–452, 2006

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BACKGROUND

For many science museums, schoolchildren make up a significant, if not the largest, component of the institution's overall visitorship. Studies of fieldtrip impacts have shown that school fieldtrips can have lasting impacts on students, with strong memories of both cognitive and sociocultural contexts (Falk & Dierking, 1997; Henry, 1992; Wolins, Jensen, & Ulzheimer, 1992). While studies have shown that previsit orientation and postvisit follow-up generally improve the learning potential of a school fieldtrip (Anderson & Lucas, 1997; Bitgood, 1994; Falk, 1983; Farmer & Wott, 1995; Gennaro, 1981; Koran et al., 1983; Kubota & Olstad, 1991; Orion & Hofstein, 1994), there has been little study of what kinds of instructional or management strategies teachers use during the museum visit itself. Although the students are considered the learners during the fieldtrip, their experiences are typically shaped by the teacher. Falk and Dierking (2000) suggest that visitor choice and control are important aspects of the museum-learning context—new knowledge is selected and tailored by interests, prior knowledge, and even other people within their group. During a school fieldtrip, however, choices are typically made for the students and students may have little control over the day's agenda. The teacher plays a pivotal role; an investigation of primary student museum visits revealed that the classroom teacher played an important role in affecting the strength and vividness of visit recollections (Wolins et al., 1992). However, Griffin (1994) reported that teacher involvement in student learning in a museum ranged from actively working with students in small groups, to monitoring student behavior, to leaving students to fend for themselves as they took a break from teaching. Both of these examples suggest that the educational worth of a museum fieldtrip may be heavily dependent on the instructional strategies of the teacher leading it.

Few studies of teacher-led fieldtrips to informal science institutions (or any museum-like sites) have closely examined the experience from the teacher's point-of-view (Anderson & Zhang, 2003; Griffin & Symington, 1997; Lucas, 2000; Storksdieck, 2001; Tuckey, 1992). Taking students out of the familiar learning environment that is the classroom and placing them in a new learning environment has implications not only for student learning and behavior, but for teacher behavior as well. Thus, identifying the strategies used by teachers in a nonclassroom setting provides a picture of the teacher perspective and the overall fieldtrip experience. With that, it becomes easier for science museum and science teacher educators to target particular strategies that have the potential for helping or hindering student learning.

Within the field of museum studies, Falk, Moussouri, and Coulson (1998) have attempted to understand the museum experience in terms of the visitor's agenda. The *visitor agenda* was defined along two dimensions: the motivation for visitation and strategies used during the visit. Three general types of strategies were identified, ranging from *unfocused*, to *moderately focused*, to *focused*. Unfocused visitors include those who have no specific plans and are generally open to whatever experiences the institution might offer. Moderately focused visitors may be more aware of what is available at the museum, including particular exhibitions, and might make viewing that particular exhibit a part of their overall plans for the day. Focused visitors came to the museum with a particular goal in mind, to the exclusion of other exhibits or opportunities that might be available. Analysis of visitor learning along this dimension of agenda revealed that visitors with a focused strategy were better able to describe their understanding of a particular subject area after their visit. Focused visitors also spent a significantly longer time in the exhibition compared to the unfocused visitors. Falk et al.'s study suggests that both the visitor's intention for coming to the museum, as well as the way the visitor utilizes the museum, can impact learning. For this investigation, the *teacher's agenda* will be examined, with emphasis on the way they utilize the museum setting to promote (or inhibit) learning.

PURPOSE OF STUDY

The study reported here was part of a larger investigation that sought to describe agendas held by teachers for conducting class fieldtrips to museums or similar institutions of informal learning. The findings presented here focus on the identification of strategies (part of the teacher's fieldtrip agenda) implemented *during* school fieldtrips to science museums. By examining these strategies, we may obtain a better understanding of how teachers perceive and cope with different learning environments, as well as provide teacher and museum educators a better understanding of teacher behaviors in these nonclassroom settings. Two questions guided this part of the investigation:

1. What strategies do upper elementary teachers report using during their fieldtrips to a museum or similar institution?
2. To what extent are these strategies related to observed fieldtrip practices in an actual setting such as a natural history museum?

METHODOLOGY

This investigation is primarily descriptive in nature in that it attempts to better characterize a phenomenon (the museum fieldtrip) from a teacher's perspective. In order to address the research questions, both qualitative and quantitative methodologies were used.

A survey consisting of open-ended questions, as well as closed, demographic-type questions, was used to identify teacher instructional strategies for a successful school fieldtrip (Phase 1). The survey was distributed to upper elementary teachers throughout the Los Angeles area with responses returned to the researcher by mail. A mailing list of 1000 teachers was generated from teacher names available on local school and district web pages; a sample of 400 teachers was randomly selected from this list to receive the questionnaire. Modest incentives were offered to those teachers who returned their information in a timely fashion. Additional teachers were randomly selected from participants at an area teaching conference. Altogether, a sample of 115 responses was obtained. This low response rate might be attributed to the length of the survey and the prevalence of open-ended questions. In addition, it would be reasonable to assume that those teachers who do not lead fieldtrips would be less likely to respond. Comparison of the teachers participating in the project with the overall County population revealed similarities in teaching experience (12.3 years in sample vs. 12.0 years for County) and suggested that teachers selected for this study worked in schools with lower SES students, indicated by participants in lunch programs (67% for sample and 60% for County) and larger population of English learners (48% for sample and 33% for County). These demographics suggest that the subpopulation examined for this survey was similar to the overall teacher population within the region, and could be considered representative of fieldtrip-taking elementary teachers in the area.

Responses were analyzed through open coding to uncover properties and patterns within the data (Straus & Corbin, 1998). Categories were identified to contextualize the phenomenon of fieldtrip strategies and begin to develop a clearer picture. Based on this initial analysis, a coding scheme was established (see Appendix A) that was used to identify strategies for all survey respondents. This also allowed for calculation of frequencies of the different strategies reported.

In order to address the second research question and examine what these motivations and strategies look like in practice, an in-depth study of 10 teachers was conducted (Phase 2). These teachers were selected from a list of reservations made for visiting the Natural History Museum of Los Angeles County in the spring of 2003. The qualitative approach

for this part of the investigation was aimed at documenting the specific experiences of each of these teachers as they conducted their fieldtrip (which had already been scheduled.) Each in-depth study included three stages: a previsit interview with the teacher based on questions from the mailed survey questionnaire, observation of the students and teacher during their fieldtrip to the natural history museum, and a follow-up interview with the teacher. Interviews were conducted in person in the teacher's classroom or by phone. Unobtrusive observations were made at the museum during the fieldtrip; as this was a descriptive study of a phenomenon that was not particularly well defined, the observations involved continuous recording in which a running account of all behaviors was recorded by hand (Gall, Borg, & Gall, 1996). These notes were transcribed and analyzed, again through open coding, in order to identify recurring patterns within the data.

The demographic information obtained for these teachers and their schools revealed characteristics quite similar to the sample of responses obtained via the survey method, suggesting that these might be considered representative of the larger population. Profiles of these teachers and their schools are provided in Appendix B. The rich descriptions provided by this qualitative approach not only helped to support the survey data, but also provided additional details of what these museum strategies looked like in practice.

Natural history museums, like the one used as a setting for the second phase of this study, typically feature collections of natural objects, such as fossils, gems, and preserved fauna. Displays are often static, with limited visitor interaction with the objects themselves. Information is gleaned through observation, label reading, or possibly through a museum interpreter or other volunteer. The strategies identified here from fieldtrip observations occurred within this traditional context; it is difficult to say what other strategies might be observed in a more interactive setting such as a science center or a venue that features living animals such as a zoo. However, given that these other sites have some similar characteristics (novel displays with explanatory label copy, large exhibition halls with a variety of themes, staff volunteers, etc.), it seems likely that the strategies reported here within a natural history museum could be observed in other settings as well. It is likely, however, that additional strategies related to manipulatives would be present in more interactive settings like science centers.

RESULTS AND ANALYSIS

Identifying Fieldtrip Strategies via Survey

Teachers participating in the survey portion of the study were asked to "describe what strategies you use to make your museum fieldtrip successful . . . [and] consider what you do during the fieldtrip as well as anything you might do before or after." For this analysis, a strategy was broadly defined as some action taken or prompted by the teacher. Overall, previsit strategies were most commonly reported, with 92% of the teachers describing some sort of instructional or organizational strategy completed before the actual visit. Only 69% of participating teachers were still able to describe some of the instructional strategies they might use during the fieldtrip itself. It would seem that teachers are better able to describe what they do before the trip than what they actually do once they are on site.

Three categories of *during-visit strategies* emerged from the data (Table 1). The *student engagement* strategies described by teachers ranged from questioning, pointing out, and exploring, to completing scavenger hunts, note-taking, and docent-guided touring. This broad array of activities could be broken into two fundamentally different groups based on how organized or structured they are. The *structured student engagement* strategies, such as docent talks or worksheets, are probably more recognizable by students and teachers as

TABLE 1
During-Visit Fieldtrip Strategies Obtained from Survey Analysis

Strategy	Teachers Using Strategy (N = 115) ^a	Sample Responses
Structured student engagement	44%	
<i>Information seeking</i>	39%	During the fieldtrip, we might have a teacher-generated or museum-generated assignment. I could be a one page "scavenger hunt" or "I spy" list of things (animals) to find or things to do [24] I have the students take notes as they walk around the museum. I have them draw pictures, too [73] ...providing students with an activity/or task/or goal during the trip keeps them focused [65]
<i>Information receiving</i>	7%	[I] clarify what the tour guide (if one is supplied) is explaining during the excursion [56] Most of the field trips are led by a docent that provides the students with specific information [32]
Unstructured student engagement	22%	[I] point out interesting things. Follow kids' interests [66] In the exhibits I would explain to the students what they are looking at and how it relates to the subject matter they are learning in school [96] During trip: Discussion (rarely note taking), observation skills taught in classroom [70]
Supervision	16%	During the day, [I] have adults stay with certain groups of kids [52] During the field trip I divide the class into smaller manageable groups [75] Keep kids comfortable/feed [8]
Event Documentation	4%	[We] take photos to share at Open House and then give to students [37]
No during-visit strategy reported	31%	

^aTeachers often reported more than one strategy; percentages therefore sum to more than 100%.

similar to learning activities they might find in a classroom setting. *Information-seeking activities*, such as completing worksheets, taking notes, or sketching artifacts, require the student to find and record information presented through the museum exhibits. *Information-receiving activities*, such as guided tours or staff presentations, may not require student documentation, but involve students listening to or observing the presentation of specific, organized content.

In contrast to the structured strategies, the *unstructured student engagement* strategies might be considered less formal and more spontaneous, as well as less dependent on specific previsit preparation on the part of the student, teacher, or museum docent. Commonly cited examples included discussing, sharing, asking, or answering questions, pointing out items

of interest, reflecting, facilitating, and guiding. Unfortunately, more detailed examination of these unstructured strategies is limited by the lack of detail in the teacher responses analyzed from the surveys.

In addition to student engagement, strategies related to *student supervision* were reported by teachers. These strategies included student grouping, chaperone guidance, keeping track of both students and time, and other references to student behavior. Another category, *event documentation* included strategies such as taking photos or videotaping during the trip. In some instances these were done by the teacher; in others, by the students. From the responses provided, however, it seems that this activity is geared more toward creating a chronicle of the event and the students' participation, rather than documenting specific content.

As one might expect, teachers reported conducting multiple strategies for their fieldtrips. *Structured student engagement* strategies were most commonly reported (43%) and of those structured activities, *information-seeking activities* (such as worksheets) were more common. It is worth noting, however, that almost 30% of the teachers who specified using a worksheet or other structured engagement strategy, qualified their response ("probably," "would try to," etc.), suggesting some tentativeness for this strategy.

Identifying Fieldtrip Strategies via Observation and Interview

The in-depth studies of 10 teachers revealed during visit strategies that could be grouped into some of the same broad categories identified by the survey results (*structured student engagement, unstructured student engagement, supervision, and event documentation*), careful observation of each of the teachers' fieldtrips provided a more fine-grained look at these strategies. Furthermore, first-hand observation led to the identification of additional strategies not found within the survey data.

Structured Student Engagement Strategies.

Information-Seeking Strategies. Worksheets or other student-writing activities were observed for several of the fieldtrip observations. As reported in other studies, teacher use of worksheets varied, although they clearly saw it as a tool to keep students on task during the visit. One teacher expressed some disappointment in the fact that his students had completed their worksheets so quickly; he explained that he would need to create a longer or more detailed worksheet if they were to do this again. Also verified through this observation was the role of the teacher or chaperone in facilitating the worksheet experience—instances of worksheet use were often enhanced by the teacher with discussion and directed observation of particular exhibits.

Information-Receiving Strategies. Many of the teachers in this group liked the idea of a museum "expert" talking to their students about particular topics during the fieldtrip. Despite this positive response to these interactions, observations of docent exchanges with these school groups at this particular museum revealed that the mediated experience varied tremendously depending on the staff member or volunteer. Two important factors seemed to influence the educational value of the interaction—the *level of student involvement* and the docent's *ability to meet student needs*. Student involvement in their learning varied; in one instance, students simply sat and listened to a lecture on bird feathers, while during another tour, students volunteered to help demonstrate how a walrus might use its tusks.

A second factor that differentiated these presentations related to the presenter's *ability to meet student needs*. Also, when staff members had high energy and obvious interest in the students, and used explanations that connect to student experiences, students were likely to

respond more positively than when presenters were unable to reach students at their level. For instance, Art's third-grade class, consisting of many English learners, encountered a docent in the ice-age fossil hall who asked the students and teacher whether anyone had any questions.

Student: How do they put the bones together?

Docent: Well, I'm not a paleontologist, so I'm not exactly sure. But I do know that they find clumps of bones . . . and they piece them together . . . Overall, they know how they go together.

Art: It's like a big puzzle.

Docent: Yes. And sometimes they get it wrong, and years later, they may have to go back and change their ideas.

Although the docent was quite genuine in her offer to assist, she seemed to be caught off-guard by the question, as if it were too simple. The teacher intervention here did seem to help to connect the idea with the students' experiences, although the question was not really answered. When asked about the interaction, Art indicated that he too felt that the docent, though very nice, was not really able to address the student questions at their level.

Given this variability of interactions with museum explainers, it seems that a teacher's decision to use staff-mediated interactions as a student engagement strategy may be based on an implicit or traditional belief that these mediated experiences will promote learning. One teacher explained, "I don't know a lot . . . about the birds . . . Having experts to explain what's in the exhibits would be nice."

Unstructured Student Engagement Strategies. Unlike worksheets or museum staff presentations, *unstructured engagement strategies* are more flexible in their execution and lack a formal structure or an established routine. The inability of teachers to specify particular during-visit strategies, as seen in the survey analysis, may also reflect the informal nature of these interactions. In categorizing these unstructured engagement strategies, it is important to recognize that some may actually be more organized than others, and that any given strategy will differ depending on the teacher utilizing it.

Interpretation. A common strategy used by many of these teachers, at least a few times during their visit, involved relaying or interpreting the meaning of an exhibit or object, based on the teacher's prior knowledge or information found in accessible label copy. This would be considered a teacher-directed strategy, as the instructor determines what the students should focus on; students are expected to listen and learn and possibly ask questions. This is not unlike the traditional role a tour guide or docent might play leading a group through the museum, and it seems likely that the teacher feels obligated to fill this role. Although the students might gain the same information from label copy, the teacher chooses to convey this information verbally to direct student attention.

Connecting. An extension of interpretation, *connecting* involves helping students make explicit links between exhibits or objects in the museum and some aspect of the classroom curriculum. Like interpreting, this is still a teacher-directed strategy, as the teacher is again guiding student attention. However, successful connections sometimes led to discussions where students recounted some of the things they had learned in class. For instance, Richard was observed joining several students near a seal diorama where he pointed out that the scene on display was similar to a story they had read about native Alaskans as part of their language arts curriculum. Student responses of "ohhh, yeah" and nodding seemed to

indicate that this connection added another layer of understanding. Several students were even able to offer more detail to the conversation. Richard found numerous opportunities for connecting their themed language arts units to science and social studies exhibits throughout the natural history museum.

Facilitation. This strategy differs from *interpretation* in that the teacher does not direct students' attention to a particular display or topic, but rather poses open-ended questions or provides comments that contribute to meaning making. *Facilitation* is one way through which teachers can provide some guidance to an otherwise student-directed discussion. An example of this would be Elizabeth's interaction with her students in the African Mammal hall. As students commented on what they saw ("I didn't know the horns were so big."), the teacher would respond with a question to relate their comment to a particular concept or idea ("Why do you think they have such big horns?").

For Elizabeth, the facilitation strategy was also useful in helping her English learners to practice speech. On several occasions, when she observed students touching specimens or pointing out artifacts to other students, she would ask the student to describe what they observed, or why it was so interesting, as a way of helping them refine their language skills. Note that the teacher intervention here was still not to direct attention, but rather help the students express themselves.

Observation of this same teacher over the course of the 2-hour fieldtrip revealed that the frequency of her use of facilitation strategies decreased as the visit continued. Toward the end of the trip, *facilitation* was replaced by a greater frequency of *interpretation* in which the teacher was directing attention and commenting on the different displays. It is possible that this shift may have been a reflection of fatigue (for both students and teacher), but a more likely culprit was time. Elizabeth commented that she did not realize she was going so slowly and that she wished she had allowed more time for some of the other exhibit halls. Regardless of reason, it is important to recognize that both facilitation and interpretation may be used by the same teacher, depending on what circumstances dictate.

Label Reading. Another strategy adopted by several teachers in this group involved the use of exhibit labels. Two variations of this strategy were observed. One variation, *deliberate label reading*, found the teacher directing students to read out loud to the rest of the group. As the student read, the teacher would assist if necessary, or stop to clarify a word that might be unfamiliar. A brief discussion might follow, sometimes involving interpretation (teacher directed), or facilitation (teacher assisted). This strategy seemed more effective in engaging students in smaller groups when they could gather around a particular display to see what the label was referring to, or even read along. When used with larger groups, students seemed to have difficulty hearing the student who was reading and often could not see what was on display.

Mary, a fourth-grade teacher, encouraged her students to read labels throughout their time in the museum. She explained to her students: "Our exploration today is not just about seeing. There are many wonderful, beautiful displays . . . but we can do more than just look . . . we can also read. We need to read about what we're looking at." Although during most of the visit she watched over her class of 28 students as a whole, in several halls, the group was allowed more freedom to flow. In these settings, Mary proceeded to examine displays or objects using deliberate label reading with a smaller group of students. Later, toward the end of the visit time, several of the students who had been participating in the deliberate label-reading were observed reading exhibit labels (sometimes out loud) and examining the corresponding exhibit pieces on their own. Thus, it seems that Mary's interaction with the students and displays served to model a museum behavior that students were able to repeat later in the visit.

A second variation, *complementary label reading*, involved teachers prompting students to read and find the answer to a question they might have about a particular exhibit or display. For instance, Art used this strategy several times with his third graders as they viewed several mammal dioramas. The following conversation took place at a diorama featuring a family of coyote in a desert habitat.

Art: What do they call that hole?

Student 1: Home?

Art: A home? Well, yes. But what other names? What else do we call that?

Student 2: A cave?

Art: Think about what it's used for. For the family.

(Several students make additional guesses.)

Art: Did anyone find it, the name of the home? I'll give you a hint. It's under "notes" (referring to the label).

Student 3: Burrow!

Art: Yes, that's right!

In this conversation, although there were probably several correct answers to Art's question, he was looking for students to use a particular word. Although this would be considered a "closed" question, it did serve the purpose of introducing new terminology to his English learners.

Throughout the museum visit, Art familiarized his students with the use of exhibit labels by prompting them to read to find out more about objects on display. Although he did not feel that the subject matter (mammals) really fit his grade-level science curriculum, the student's interest in the dioramas and other displays allowed him to make connections to language arts skills. Thus, these label-reading strategies have the potential to serve several desired goals, including reinforcing of language skills in nonclassroom settings as well as helping students understand how to use a museum. This is not to say that one strategy is necessarily better for a particular goal—in the examples described above, language practice and museum-going practice were both desirable outcomes.

Orientation and Advance Organizers. Several teachers recognized the need for some sort of orientation as their class moved from hall to hall and topic to topic. An advance organizer was used in these instances to prepare the students for what they would see next, or how the exhibit might relate to things they had been studying back at school. These were primarily verbal organizers, although they sometimes made use of museum signage as a hook or point of emphasis. For instance, Richard used the map of Central and South America located at the entry to the Pre-Columbian archaeology exhibit to help relate what they were going to see to what they had studied in class. For this class, the museum map resembled the display in their classroom they had developed for an earlier reading unit, where they had mapped out where their parents or grandparents were born.

Not all halls had "built-in" organizers as described above. Nevertheless, Art provided a verbal organizer before entering most halls. He would typically begin by pointing to the sign over the entrance, asking his third graders to read the name of the hall. He would then pose a question of some sort, sparking responses or more questions, before entering the hall. For instance, before entering the North American Mammal hall, he asked his third-grade students where North America was. A brief discussion led to the reminder that the United States (including California), Canada, and Mexico made up North America, and that the mammals shown inside could be found in those countries. Not only did this exchange provide a context for students to build upon as they viewed the dioramas inside, but it helped generate interest in the exhibit as well.

Although Richard and Art apparently recognized the need for some sort of cognitive organizer within the museum setting, both essentially made up these exhibit introductions as they came to each hall, using prior knowledge or museum cues. While it might seem like a familiar strategy within a classroom setting, the use of advance organizers to introduce exhibit halls was not particularly common among the teachers in this group, and was not mentioned by any of the respondents in the fieldtrip survey.

Free Exploration. The most student-directed of strategies used by many of the teachers at one point or another during their museum visit was *free exploration*, in which students were permitted to roam and investigate whatever they wanted within an exhibition hall or part of a hall. Although the exact dynamics of the exploration time varied from group to group, students generally seemed very excited to have this control of choosing what to look at. Students investigated the hall in small groups or sometimes alone. They looked and talked with their classmates about what they saw. Sharing their discoveries and ideas seemed to be an important part of this process. Students often pulled other students over to a particular object or display to show them what they had found. Although some students would read exhibit text, most did not. For instance, a group of students from Mary's class were observed near a wolf diorama. There was considerable discussion about what the wolves were doing; several students pointed to the scenery painting at the back of the diorama that showed a steep valley leading down to some specks of animals, possibly prey. This exchange lasted about almost 2 min before the group moved on. In this case, these students made no attempt to read the exhibit labels; understanding was developed through observation and discussion.

In some cases, the teacher's directive for free exploration was very explicit: "Alright everyone, for the next 15 minutes you can look around on your own, but be sure to stay within this room." In other cases, the free exploration time grew out of a change in setting, such as moving from one hall to another, or an unclear transition between activities. For instance, when Monica noticed that her group was spreading out and exploring the many different displays in one of the larger exhibit halls, she simply allowed them to continue on their own. She eventually retrieved the students who had rushed through the exhibit and brought them back where they could be observed more easily. She also indicated that she wanted to slow them down, have them look at the displays more carefully. When asked about the subtle transition to free exploration, Monica explained, "Because they didn't get any direction, they just kind of went where they wanted. In the classroom, you give them options as to what they can do, or even tell them what needs to be done."

Not surprisingly, the apparent engagement of students during a free exploration seemed to be dependent on time. Short explorations found most kids engaged most of the time. However, as the engagement continued, student exploration behavior sometimes decayed into less productive behaviors. How long this shift to nonengagement might take, as well as the overall effectiveness of the free exploration, seemed likely to be dependent on teacher discipline characteristics and possibly student fieldtrip experience.

Supervision Strategies. Within the museum context, not only are teachers faced with a foreign setting, but they must also deal with students whose behavior might be considered atypical or exaggerated, also caused by the novel setting. Individual students or groups of students may require special interventions and as in the classroom, different teachers have different supervision styles. However, observation of the 10 groups revealed a few common supervision strategies that had the potential for influencing the overall fieldtrip experience.

Keeping Track. Although this is a somewhat broad categorization, it refers to the teacher's attempts to maintain awareness of their class or portion of their class in the novel nonschool setting. Several teachers in this group, in addition to many of the survey respondents from Phase 1, suggested that keeping track of students was one of the most difficult aspects of the fieldtrip experience. Art admitted, "Much of this stress comes from knowing that you are responsible for these students. At school, we take this for granted, although we still need to be careful about sending kids out [of the classroom] with buddies and such." The extent to which this strategy was used varied from teacher to teacher; it seemed to be a reflection of their concerns with students, as well as their overall confidence in navigating this new learning setting themselves.

Refocusing. Another supervision strategy derived from the observational data involved pulling the students together to reiterate rules, learning objectives, or directions. Almost all teachers observed in this part of the study utilized this strategy at some point during their fieldtrip. It could be done anytime throughout the visit, although it often happened as they were accounting for all of their students. The primary purpose was to redirect student focus, especially if the teacher sensed that students were not getting as much out of the experience as they might. Sue described her refocusing discussion with her small group of six students:

I was reminding them to focus more on what they were seeing. I asked them to take a closer look at the dioramas, both the background and foreground, since they will be switching teachers {for another unit} and making dioramas for an upcoming project. I wanted them to see that one too [pointing to a diorama in progress], since it shows how the diorama was being built.

In this case, the teacher wished to emphasize a learning opportunity at a particular point in the visit. In other instances, the primary concern was student behavior, where the teacher attempted to refocus the students' attention on behavior changes, the setting in general, and even upcoming plans.

Engagement vs. Supervision. While *keeping track* and *refocusing* are two supervision strategies used by teachers during a fieldtrip, it is also important to recognize that many of the engagement strategies also served a management purpose. Both John and Richard expressed concern for keeping students occupied during the visit, and attributed the behavior (or misbehavior) of their students to the effectiveness of their worksheets. The advance organizer is another example of a strategy used by several of the teachers that also served as a management or supervisory role, as it helped focus student attention, typically related to content. Other engagement strategies, such as staff presentations and even teacher *interpretation*, in some cases seemed to support student supervision as well.

Event Documentation. This category, similarly derived from the survey analysis, involved capturing aspects of the trip through photographs or video. While taking photos allowed teachers (and students) to document their experience at the museum, several other purposes were also revealed. In order to avoid the distraction of students with cameras, Sue told her class that she would be able to take pictures for them with her digital camera. Furthermore, if a student saw a display they found particular interesting or possibly related to an upcoming research project they were thinking about, the teacher offered to snap the photo for the student, who would then be able to access it later via the classroom computer. Sue also mentioned using photos of the fieldtrip in conjunction with the parent open house as a way to spark conversation between students and their parents. Thus we see that event

documentation may be used to facilitate student interest and conversation, and not just creating a classroom scrapbook.

Teacher Plan of Action. Although developing a plan of action for the fieldtrip day itself would technically be a previsit strategy, *following* it seems to be better discussed in context with the other during-visit strategies for the trip. Observation of these 10 groups revealed different levels of organization that could be categorized as *well defined*, *partly defined*, or *undefined*, and that these different levels seemed to impact the overall experience. Both Elizabeth, a third-year teacher, and Sue, a veteran teacher of almost 40 years, utilized *well-defined* action plans, choosing particular exhibit halls that they wanted their students to see, and creating a list or guide for chaperones and accompanying teachers to use during the visit. These teachers knew what they were going to do before entering the museum. Teachers with a *partly defined* plan of action had some idea of particular activities that they wanted to do with their students, but may not have known what else they would do. More often, teachers examined in these cases had *undefined* action plans. Although these teachers may have had some ideas of parts of the museum that they wanted to see, their path through the museum did not reflect an organized plan. Several of these teachers admitted having no specific overarching itinerary, having only thought about their plan of action during the bus ride or upon entry to the museum that morning.

It is difficult to say how the *plan of action* generally impacted the overall flow of the fieldtrip. For Andrea, an experienced third-grade teacher who demonstrated only a partly defined plan, it seemed that other teachers, as well as students, in her group steered the fieldtrip to a variety of exhibit halls other than the one hall (birds) where she knew she wanted to go. In this case, a vague plan and the need to accommodate other teachers resulted in extended discussions and debates after each hall regarding what they should do next. This ultimately led to loss of time. Art's plan of attack might also have been considered *partly defined*, as he admitted that he knew he was going to take his third-grade students to see the mammal halls and the dinosaurs, but did not know what else. Yet his transitions from hall to hall were much smoother than Andrea's. With no additional teachers or chaperones, Art's partly defined plan of action did not hinder the flow of the visit since negotiation with other teachers was not necessary.

DISCUSSION

A Clearer Picture

The results of the investigation suggest that teachers use a wide variety of strategies to conduct a science fieldtrip. Although several investigations have described general levels of teacher involvement during a fieldtrip (Griffin & Symington, 1997; Rennie & McClafferty, 1995), information obtained through this investigation more clearly identifies the types of involvement. While structured engagement strategies such as worksheet use and docent-guided tours have been identified and examined by researchers in previous studies, less than half of the teachers surveyed reported using these approaches. The survey suggested that less structured engagement approaches, in addition to management and documentation procedures, were also important to teachers. The observational studies clarified these further, leading to the identification of more specific but less formal strategies, and a richer understanding of how elementary teachers interact with their students and the museum setting.

Unlike worksheet use or guided tours, there has been limited documentation of unstructured engagement strategies used by teachers during the fieldtrip. This investigation

identified both didactic strategies, such as *interpretation* or *connecting*, which reflected a more teacher-centered approach as well as collaborative strategies such as *facilitation* and *label reading* which gave students a more active role in the learning process. Teacher's use of the *label-reading* strategy demonstrates that different aspects of the school curriculum, not just science or social studies or even the arts, can be reinforced through fieldtrips. Some strategies, such as the use of *advance organizers*, reflect the adaptation of traditional classroom-teaching models, while others, such as *keeping track* and *event documentation*, are unique responses to the fieldtrip experience. Although student impact was not assessed as part of this investigation, we have a better idea of what occurs during the visit that might support, or hinder, different student outcomes, including learning.

Conflict of Settings

Several of the strategies reported and observed seemed to emphasize the inherent conflict in juxtaposing the formal and informal settings and the teacher's role within that overlap. For instance, the issue of learner choice is the primary difference between the *interpretation* strategy, where the teacher directs student attention toward particular displays, and the *facilitation* strategy, where teachers allow student to direct their own exploration, while providing questions that facilitate the process. The balance between these two types of strategies varied from class to class, and even within a class, from exhibit to exhibit. Although both teacher-directed and student-directed interactions were observed, overall, there were generally more instances of teacher-driven strategies.

One of the observed teachers explained how she struggled with this question of choice in the dinosaur hall, where a staff educator was showing and describing how a paleontologist uncovers and prepares fossils. Several students in her group stopped to listen and interact with the gallery educator, while several boys walked by to another part of the exhibit. She was not sure whether or not she should go back to get the boys who had wandered ahead or just let things happen as they did. She described a conflict between a desire to teach, and wanting the students to see the museum as a fun, informal place where you can learn. Pulling the students back to listen to the presentation may have seemed too much like a formal requirement.

Although the supervision strategies may not be considered instructional strategies, many of the teachers saw these strategies as important for ensuring a successful fieldtrip. The observational studies revealed concerns over losing students, as well as keeping students focused on their learning experience. Contrast this with another reported strategy, documentation, which might seem more appropriate for a family outing or other recreational activity. Each strategy would seem to represent a different aspect of the fieldtrip—supervision strategies reflecting the formal school setting and documentation strategies reflecting the informal nature of the museum setting. It is difficult to judge the appropriateness of these different approaches, especially without knowing the overall motivation for conducting the trip in the first place. Nevertheless, it seems clear that teachers interact with the museum setting quite differently, but that the interaction must involve some sort of compromise between the perceived norms of formal and informal learning settings.

The Effects of Time

The in-depth studies revealed another conflict much less apparent from the survey data—it seemed that time (or lack of time) impacted many of the strategies teachers utilized, or planned to utilize, during their fieldtrip. As mentioned earlier, Elizabeth's strategies changed as her fieldtrip progressed, especially after she recognized that they were running

out of time. Her interaction with her students became more directed, more interpretive, as the visit neared conclusion. The shift to interpretation was one way to “cover” more and expose students to displays or objects that might be more relevant to classroom topics. Time impacts were observed for Luis, who, after spending about half of their available time in one hall, led his students on a whirlwind passage through 16 halls in less than 1 hour, where few engagement strategies, structured or unstructured, were utilized. Student interests could not be addressed, as there was no opportunity to really focus on a particular exhibit or display. On numerous occasions throughout these cases, docent or staff presentations were cut short as teachers discovered that they needed to move on or meet up with other groups. In those instances, students were often left with incomplete descriptions or explanations. Overall, many of the teachers in the study group expressed difficulty in keeping track of time during the trip. Although time management is certainly not exclusive to the fieldtrip context, it is likely that unfamiliarity with the museum’s layout or content may contribute to this problem. Regardless of cause, the apparent effectiveness of teacher strategies were clearly impacted by time.

Plan of Action and Learning

As mentioned, Falk et al.’s description (1998) of general museum interaction strategies resembles the *plan of action* strategy, described in this investigation as an indication that the teacher had some sort of overall idea for how the museum would be used. The Falk study, which indicated that those visitors with a *focused* strategy (and a specific goal in mind for their visit) showed greater levels of learning as a result of their experience, might suggest that teachers with a well-defined plan of action are more likely to support student learning. This extrapolation should be considered with caution, however; since the learners on these fieldtrips (the students) were not typically determining the plan of action for the fieldtrip, it is unclear how much difference it would make whether or not the plan is well defined. In fact, observations suggest that even teachers with an undefined plan of action were able to utilize more specific during-visit strategies, such as *label reading* or *facilitation*, to create what appeared to be effective learning episodes. More detailed observations and documentation of student conversations tied to postvisit interviews with students might better clarify the links between a well-defined plan of action and student learning.

Implications for Practice

To better to support teachers in their use of fieldtrips as instructional tools, museum and teacher educators should consider how they might build on the types of strategies that teachers are already likely to do. Several researchers have provided suggestions for creating more effective learning experiences using structured engagement strategies such as worksheets (Fry, 1987; Kisiel, 2003a; McManus, 1985) or guided tours (Cox-Petersen et al., 2003). As such, the discussion here will focus on the other strategies identified.

Many of the teachers observed seemed to make classroom connections in situ, often on the spur of the moment. The fact that less than 70% of survey respondents were able to describe during-trip strategies further supports this observation. While strategies such as *connecting* lend to the relaxed or informal nature of museums, it might be helpful to provide a mechanism that would allow teachers to plan for strategies, including effective on-site *connecting*. Museum staff might consider looking more closely at the classroom curriculum by examining state or local district science content standards, as well as those for

language arts and math—two subject areas that currently dominate the elementary curricula. Direct contact with local teachers and administrators, through interviews or focus groups, will probably provide the best picture of curricular pressures and apparent gaps in student understanding that the museum can help bridge. Teacher training, a web-based guide, or even museum signage might then be developed to help emphasize the connections identified by these front-end evaluations. With such resources, teachers might be able to better customize their experience, linking museum exhibits to classroom discussion (*connecting*), and provide additional explanation (*interpreting*).

Supporting teacher supervision strategies may prove to be more challenging. Certainly, the museum can provide lists of expectations for school groups that may assist teachers in their behavior clarification. Some museums, including the Natural History Museum studied here, also provide written chaperone guides, written materials that help school volunteers, often parents, understand what is expected of them during their stay. If teachers are informed of the configuration of particular halls that might be confusing or significantly different from other areas of the museum, teachers may be better able to prepare students for those experiences and subsequent behavior expectations. This information will also allow the teacher to strategize *keeping track* for that particular hall once they arrive on-site. Although novelty-reducing efforts are often recommended for students, here it would seem that reducing teacher novelty concerns, and subsequently supporting management strategies, would also contribute to a better experience.

None of the aforementioned examples involves significant modification of the museum setting itself; rather they consider the feasibility of highlighting the existing organization of the institution in a way that is more useful for teachers. Considering the politics that exist within the school context and the tendency for pendulum-like legislation that ultimately affects what the teacher does in the classroom, changing the exhibits, or even label copy, to suit a relatively specialized audience of teachers seems like a costly approach. The assistance to teachers then becomes an additional layer of interpretation that is more attuned to their context. However, attention must still be paid to the challenges and needs of teachers within the classroom so that museum support can adapt to those changes. Programs and educational strategies developed by the museum for school fieldtrips 10 to 20 years ago, although seen as effective at that time, may no longer suit the needs of the schools and teachers. Continual re-examination of those fieldtrip strategies is an important part of the institution's support for teachers.

If we consider that some teachers may be unable to identify strategies that adequately support their overall motivation for the trip, providing suggestions may strengthen the agendas and lead to experiences better aligned with the teacher intentions. One strategy not specifically mentioned by survey respondents, but observed in the in-depth studies at the natural history museum, was use of an *advance organizer*. When this strategy was incorporated, teachers seemed to regain student attention, allowing an opportunity to get them thinking about a new topic. Contrast this with teachers who whisked students from hall to hall with little mention of what they would see or do there. The purpose of an advance organizer is to provide support for the acquisition of new knowledge by strengthening the organization of pre-existing knowledge (Ausubel, 1977). Expanding on this, Joyce and Weil (1996, p. 273) suggest that an effective organizer would involve presentation before the learning experience, as well as revisiting the organizer afterward, as a way to solidify understanding. To facilitate the use of this strategy, museums might consider creating explicit advance organizers for different halls during field-trip hours. Observational data suggested that when an advance organizer was present, teachers tended to make use of it. For some exhibitions, several organizers might be

created, demonstrating to teachers how the same displays might be used to emphasize different concepts or themes. These organizers could also be provided on a Website or via a printed museum guide, possibly linked to a map, in order to help teachers prepare their students for the experiences they will encounter before they enter a hall. The organizers would also emphasize the importance of reiterating ideas as the students left the hall.

The fact that teachers may recognize the opportunity to reinforce reading and language skills during a school fieldtrip should not be ignored by the museum when considering how best to foster teacher use of the museum experience. One way this might be achieved would be to point out places within the museum where *label reading* might be more easily conducted or more effective for the group. This would require examining the reading level of different exhibits and displays, as well as the configuration of space surrounding the panels that might allow for students to cluster and more easily see and hear, as studies have shown that the structure of the exhibit and surrounding area may promote (or restrict) group learning (Borun & Dritsas, 1997). In some cases, it might be possible to create an exhibit primer, in which “student friendly” descriptions are provided that allow students to read and better understand what it is they are seeing. There is one note of caution, however. As mentioned, fieldtrips and fieldtrip worksheets have been criticized for turning a visual experience into something comparable to skimming an encyclopedia for the correct answers, and removing all student choice from the experience (Griffin, 1999; Price & Hein, 1991). The recommendation described here is based on considering how the museum might support teacher intentions, not how the teacher might benefit from museum intentions. Providing teachers, and their English-learning students, with ways to access the items on display may be one way to encourage teachers and other decision makers to utilize informal institutions less reluctantly as an important part of their curriculum.

The suggestions made here, based on data from this investigation, as well as previous studies, involve both adaptation to fit teacher behaviors, and approaches involving teacher development and training. They also attempt to alleviate some of the inherent conflict teachers’ experience that results from the overlapping of formal and informal learning settings. However, as Falk et al. (1998) suggest, the strategies for utilizing the museum setting make up only one part of the visitor agenda. The choice of strategies is likely related to the other aspect of this visit agenda—the visitor’s motivation for coming in the first place. In the case of school fieldtrips, this means that the choice and implementation of strategies used by teachers during a fieldtrip may be tempered by their rationale for leading the visit in the first place. Initial efforts to identify clear relationships between strategies, as reported here, and motivations have not revealed strong connections between these components, due in part to the fact that teachers often have overlapping intentions (Kisiel, 2003b). Even if there is only a weak connection between intentions and strategies, a closer examination of fieldtrip experiences might be used to identify which, if any, of the teacher strategies identified here would be more likely to facilitate student learning, or perhaps other desirable outcomes. Nevertheless, understanding what teachers actually do on a trip to a science museum, zoo, or nature center is an important step toward enhancing the learning opportunities provided during a fieldtrip, and providing teachers with the support and training necessary to create a positive learning experience for their students.

APPENDIX**Appendix A:
Coding Scheme for Strategies Reported in Survey**

Strategy Category	Criteria for Coding
Student engagement, structured	Includes worksheets and docent presentations; one of the two following categories would need to be coded in conjunction with this:
<i>Information seeking</i>	Includes mention of students completing worksheets or taking notes during the visit. If this is coded, then structured student engagement is also coded.
<i>Information receiving</i>	Includes mention of docents or staff facilitation. This could be in the form of a guided tour or a stationary presentation. If this is coded, then structured student engagement is also coded.
Student engagement, unstructured	Includes less formal methods of engaging students during the fieldtrip. This might include things like “pointing out,” “showing,” “exploring,” “discussing.” It might also include vague references to self-guided touring the exhibitions or some sort of learning experience.
Event documentation	Includes mention of student or teacher taking photos or video of the visit. Does not need to mention what will become of the pictures.
Supervision	Includes mention of discipline, behavior, “keeping track” or “trying not to lose anyone” or other student-related issues.

**Appendix B:
Teacher Profiles for In-Depth Studies**

School	Distance from Museum ^a (miles)	English Learners (%)	Students in Free/Reduced Lunch Programs (%)	Participating Teacher ^b	Grade Taught	Years of Experience
1	5.5	67	90	Mary	4	3
2	23	66	90	Elizabeth	4	3
3	7.5	81	97	Richard	4/5	3
4	28	16	20	John	5	8
5	15	26	75	Sue	3	39
6	20	81	92	Alice	3	13
7	20	47	96	Luis	4	15
8	16	8	41	Andrea	3	31
9	7.5	76	82	Monica	4	7
10	3.5	98	98	Art	3	9

^aThe natural history museum used for this investigation is located near the center of a large, sprawling urban community which subsumes almost all of the schools listed here. Only school 4 might be considered to be located within a suburban area.

^bNames listed are pseudonyms.

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