Natural history museums offer opportunities for hands-on learning experiences that enable children to build their science understanding. Many of these tips for planning and implementing field experiences also apply to other explorations outside the classroom.

Young Learners at Natural History Museums

Leah M. Melber

National standards spell out the importance of high-quality science experiences for all students, even the youngest learners (National Research Council, 1996). One of the most effective ways for young children to learn about science is through first-hand experiences with authentic objects and real specimens (Bain & Ellenbogen, 2002; Hadzigeorgiou, 2001; Michener & Schultz, 2002; National Research Council, 1996; Rennie & McClafferty, 2002).

While there are a number of hands-on elements that can be easily added to the classroom, natural history museums are an excellent place to gain valuable experiences with objects that are not available elsewhere. For decades these institutions have supported science literacy within the general population (Melber & Abraham, 2002) and provided access to rare and even priceless natural treasures.

Many educators are quick to see the importance of early childhood visits to highly interactive science centers and children’s museums. Because field trips are often remembered well into adulthood (Falk & Dierking, 1997), it is clear just how important they can be in developing science literacy and excitement about the natural world.

Some early childhood teachers find they need guidance, however, in structuring visits to more traditional institutions such as natural history museums. Successfully exploring a museum with young learners takes planning. Questions often arise on how to best organize explorations. This article guides early childhood educators to discover how natural history museums can engage young children and presents methods on how to take advantage of the unique attributes of these institutions during a visit.

Natural history museums sometimes have a dated exhibit style that can limit the early childhood learner’s access to information (Tunnicliffe, 1996). While making meaningful connections may require a unique outlook and careful planning, the potential for an amazing experience is significant. Several researchers (Melber, 2007; Tunnicliffe, 1996; Tunnicliffe & Reiss, 2000) have found even the most traditional museum environment can inspire critical thinking and higher-level dialog among young learners.

Museum Visits to Build Science Literacy

Young children have a “boundless curiosity about the world” (National Association for the Education of Young Children, 2007, p. 1) and can benefit from extensive opportunities to explore this curiosity and build an appreciation for and enjoyment of science. Natural history museums, zoos, and other science environments are great places to foster children’s hunger for learning.

The National Science Education Standards are clear that high-quality science programs at all levels require “access to the world outside the classroom” (National Research Council, 1996, p. 220) and specify the critical role that science centers, museums, and zoos can play in supporting a well-rounded science curriculum.

One part of becoming scientifically literate is the ability to understand scientific content and the methods by which this subject is explored (National Research Council, 1996).

Leah M. Melber, Ph.D., is Assistant Professor, Division of Curriculum and Instruction, Charter College of Education, California State University, Los Angeles. She has conducted research within the field of informal (museum) education for more than 15 years and recently published a book on standards-based projects for field trip sites: Informal Learning and Field Trips: Engaging Students in Standards Based Experiences Across the K-5 Curriculum.
Scientific literacy includes the ability to “describe natural phenomenon [sic]” (p. 22) as well as utilize information sources such as museums to support student understanding of concepts and processes.

Scientific literacy is infused throughout the national content standards, and is perhaps best encapsulated within Content Standard A (K-4): Science as Inquiry (see Table 1). Natural history museums provide the perfect object-rich environment for preschool and school-age children to take part in inquiry-based activities aimed at building their overall science literacy. Access to these objects, either directly through touching or through close observation, provides a unique opportunity for children to participate in inquiry process skills.

For example, children can simultaneously practice observation skills as well as the process of communicating results as they describe their interpretation of an exhibit to another child. When a child compares the size of one mounted bird specimen to another, the child is collecting and analyzing data. See Table 1 for additional activity suggestions.

Matching Early Learners With Museum Content

Unfortunately, visits to natural history museums may become unnecessarily teacher-directed, with traditional methods that include marching children closely together (Seefeldt, 2005) and teaching by “pointing” and “identifying” (Taylor, Morris, & Cordeau-Young, 1997). In fact, these approaches are sometimes echoed by museums themselves with didactic, narrative tours (Cox-Petersen, Marsh, Kisiel, & Melber, 2003).

Such practices, of course, are at odds with current knowledge about early learning. Thankfully, just as methods of teaching have evolved, so has the lens through which educators view field experiences!

The National Research Council (2000) points out that younger children are much more capable of higher-level mental reasoning than once thought. This higher-level reasoning can be encouraged through scaffolding experiences as described by Vygotsky (1978) where one individual—such as a parent, educator, or peer—supports another to perform at a higher cognitive level than the individual could on his or her own.

The idea that much of the content found in natural history museums get anywhere else. Early exposure to these natural wonders of the world and the individuals who study them is just one of the many building blocks that can later lead to the development of a scientifically literate adult.

In addition, providing children with access to observe real fossils, animals, or environments can help reverse misconceptions they might have formed through the influence of popular media.

### Table 1. Meeting Science Standards in a Museum

<table>
<thead>
<tr>
<th>Abilities Necessary to Do Scientific Inquiry</th>
<th>Understanding About Scientific Inquiry</th>
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<tbody>
<tr>
<td>1. Guide children’s observation of natural objects on display. Ask questions that encourage careful observation and attention to detail.</td>
<td>1. During the visit, point out any displays or panels that highlight the work of museum curators as active scientific researchers.</td>
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<tr>
<td>2. Have children record what they see during a visit using sketches, photographs, audio recordings, single words, or simple sentences as appropriate.</td>
<td>2. Read an exhibit label out loud and ask children to explain how they think a researcher might have learned that information.</td>
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<td>3. Encourage children to construct explanations for what they see. (What do the sharp teeth of a dinosaur tell us about what the animal might have eaten?)</td>
<td>3. While moving from exhibit to exhibit, ask children to indicate which specimens they might like to study if they were scientists.</td>
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<td>4. To develop communication skills, place children in pairs and have them take turns describing to each other what they see at different exhibits.</td>
<td>4. Identify an exhibit where several different types of scientists might have worked together. For example, a diorama includes the work of a botanist and a zoologist.</td>
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The one element that sets natural history museums apart from highly interactive science centers and children’s museums is that they are based on collections. This means that in addition to the many specimens and objects on display, there are thousands or even millions of objects behind the scenes being actively researched by curators. A natural history museum is more likely to have a real velociraptor skull, taxidermied eagle, gold nugget the size of a fist, or a crystal the size of a forearm than any other institution.

The emphasis within collections-based institutions is visitors’ exposure to the real thing, an experience they cannot
might be unknown or abstract to younger learners should not be a deterrent either. In fact, it might be surprising just how much young children do know about the topics that are a common fixture at natural history museums. Even if children encounter new content during a field experience, Balling and Falk (1980) point out that this novelty is a key factor in attracting and keeping children’s attention.

Intrinsic motivation is critical to the learning process. Covington (1998) notes that within traditional educational settings, higher levels of intrinsic motivation may lead to greater cognitive gains and more meaningful learning experiences. The importance of intrinsic motivation in relation to museum visits has been identified as equally, if not more, critical (Csikszentmihalyi & Hermanson, 1995). With a focus on extinct animals, dynamic geology, and interesting cultures, it is more likely that children will find too many topics that interest them within a natural history museum rather than not enough. As the visit progresses, offering children choices and identifying personally relevant connections to content will aid in maintaining children’s intrinsic motivation and support their acquisition of new content.

Lastly, it is important to note that natural history museums are not just stuffed animals and dusty bones. Museum educators work hard to

- keep labels updated
- add hands-on elements to more traditional exhibits
- provide special programming
- stage temporary exhibitions in formats that encompass the most recent literature on learning

The best way to prepare for a successful visit to a local natural history museum is to preview the site or call ahead to identify which exhibition halls will be best for early childhood groups. There are usually more exhibitions in a museum than there is time to visit. Choosing to focus on the most updated, or child-friendly, exhibitions is a smart use of time. In addition, it is important not to underestimate the impact of an exhibit that is devoid of buttons, bells, whistles, levers, or pulleys. The impact of encountering a life-sized elephant on a 4-year-old can be utterly amazing!

**Structuring Positive Experiences**

A number of publications address logistics and procedures for conducting field trips with young children (Kisiel, 2006; Leary, 1996; Martin & Severs, 2003; Salaman & Tutchell, 2005; Taylor, Morris, & Cordeau-Young, 1997). Creating a successful field experience goes far beyond planning and recruitment of parent volunteers as chaperones. It requires insights into the type of learning that occurs in settings outside the classroom. In the following section, three cognitively related challenges—often encountered during field experiences with young children to natural history museums and similar places—are explored, as well as methods of making the most of each learning opportunity.

**Spend Just the Right Amount of Time**

The museum stairway was filled with exhausted 5-year-olds and family member chaperones. Children who had not laid claim to a step found a patch of marble floor and sprawled out on that. “Don’t you want to see the bears!!” Miss Maria asked with excitement, although she too sounded exhausted and secretly hopeful they would decline.

*During the visit, draw connections between new content and children’s prior knowledge. Riley points to his nose after touching the bear’s nose.*
The children looked at her blankly. One feigned sleep while another tried in vain to reach the drinking fountain that was too high to reach, unaware there was a child-sized version just around the corner. The teacher looked at the group and finally took a seat herself on the stairs.

This situation was witnessed at a large, urban natural history museum. Educators are under immense pressure to enrich children's cognitive development. When it comes to visits to museums, there can be significant pressure to “see it all” in one visit. This pressure increases when children only have one field experience a year and/or may not have the family support or financial means to visit the site at another time. However, the line between exposure and exhaustion is a fine one for young learners.

Museum learning research has affirmed that visits are more beneficial when they are slower paced and focus on a small number of exhibitions (Kisiel, 2006; Serrell, 1997). Not only does this strategy prevent fatigue, but the “depth over breadth” approach is consistent with national science standards (National Research Council, 1996). High-quality interaction with a few exhibitions, rather than rushing through a whole museum, will best serve children in the long run. After the pressure to “see it all” is removed from the visit, children, volunteer chaperones, and teachers alike will be able to relax into the experience.

Focus on Children’s Interests

“Can we see the dinosaurs?” the children asked in chorus.

“Only after we see the crabs,” the teacher answered enthusiastically. “Remember, we’re studying the ocean this month!”

The children follow the teacher into the marine hall and have a seat in front of a beautiful coral reef display. Although their bodies are facing the exhibit, their heads are turned more than 90 degrees, trying to catch a glimpse of the T-rex skeleton on display in the next room.

Miss Lupe points out the crabs hidden between the rocks and coral in the display. “Who can you see the crab here?” she prompts. John and Tyler start a whispered debate on how big the T-rex claws are, while Sarah slowly scoots her body toward the door for a better glimpse of the life-size skeleton.

Surrounded by amazing resources, and a bus that needs to leave by noon, it can be hard to select exactly what to see. Often, the teacher’s agenda is not in line with what children find captivating. While older students may be able to rationalize why one exhibition is more important to visit than another, younger children may find this compromise harder to accept.

Teachers can accommodate their
own goals and children's agendas by discussing the types of museum exhibitions that are available before the visit. The children can then work with the teacher to select exhibitions they want to visit, accommodating both curricular goals and personal agendas.

Connecting exhibits to classroom curriculum is what eventually helps make field experiences memorable (Wolins, Jensen, & Ulzheimer, 1992). However, a quick initial tour of exhibitions that are most interesting to children encourages their later attentiveness to exhibitions that are more in line with the teacher's agenda.

For children of any age, the novelty of the museum setting can be detrimental to the overall learning experience if children are not first provided with the opportunity to become familiar with the new environment (Anderson & Lucas, 1997). If the first few minutes of the visit focus on simply becoming acclimated, it will reduce teacher frustration and children's discomfort. Only after students reach a feeling of physical comfort and safety can higher-level, cognitive gains can occur (Maslow, 1962).

**Encourage Active Learning**

"Can you read what it says, Ms. Sarah?"

"Okay…but I think we need to sit down so everyone can see. I'll read the label aloud—and you can listen to my words while you look at the animals in the exhibit."

The students sit in front of the exhibit so they can see the animals and their teacher. Ms. Sarah begins to read the label. “Mountain lions are solitary animals and are only found in groups when preparing to breed….” Her voice trails off and she shoots her teaching assistant a quick glance.

Joey begins to pick at the exhibit rail-

**Museum Visit Alternatives**

When museum visits are limited or impossible, these learning opportunities offer equally stimulating, first-hand experiences with science.

**Block-Treks**

Science is all around, on the playground and in every neighborhood. Younger children are often hurried to school and then hurried home again with little time to investigate the many plants, animals, sounds, smells, and sights along the way. Providing time to explore the science of a community is a personally relevant and cognitively stimulating way to develop science process skills and content knowledge (Charlesworth & Lind, 1999; Russell 2001).

Conduct regular nature walks on the school grounds or around the block. While a block-trek requires parent/guardian permission, it does not require expensive bus rentals, museum admission fees, or logistical planning for an all-day excursion. The National Research Council (1996) highlights the importance of playgrounds and nearby natural areas in developing children's science understandings.

**Family Trips**

Encouraging family field trips on weekends is an excellent alternative to group excursions. These can be structured with adult-led activities (perhaps suggested by the teacher) in the first part of the visit, time set aside for a picnic lunch, and then unstructured time in the afternoon for family members and children to explore the museum on their own.

The National Science Teachers Association affirms that informal science learning sites like museums are a great place for families to “share moments of intellectual curiosity and time with their children” (1998, p. 17).

**Museum...in the Classroom**

Create a hands-on science “museum” for children’s everyday exploration.

- Display natural objects, including those that children find, in thematic groupings. Rotate them as new interests emerge.
- Take advantage of artifact loan programs run by many natural history museums. Add related library books or Web sites to the display.
- Tap into friends and family members who may have pets that would be appropriate for sharing with children such as birds, snakes, or even hermit crabs to add a living component to the setting.
- Encourage families to bring objects to add to the classroom museum.

Whatever a classroom museum includes, it is the emphasis on objects and artifacts that makes it a memorable experience for students.

**Everyday, Everywhere Science Explorations**

Museums are just one place where children learn about science. A trip to a grocery store can help children learn about nutrition (produce aisle) or ocean animals (seafood section). A visit to a doctor’s or dentist’s office can offer opportunities to develop habits about hygiene, fighting germs, and staying healthy. A local building supply store will have different types of rocks for children to compare. The nursery down the block is the perfect place to learn about plants.

By connecting with businesses and organizations within walking distance, children become more aware of how science is a part of their lives every day. Even if the destination is a public venue, contacting management before the visit will help ensure the day runs smoothly—and might even result in some added benefits for children.
ing. Jenny stomps her foot to watch her new shoes light up. Maria thinks about what she wants for her birthday. Ms. Sarah decides to take a slightly different approach.

“Who can make up a story to describe what is going on here? What are the mountain lions doing? Are they friends? Where is the food? Who has something to tell me?”

Joey looks up at the animals just as Jenny stops stomping. Maria calls out exactly what she thinks is going on in the exhibition…the mother lion is taking care of her babies.

How does a teacher create active learning around an object or specimen-centered exhibit? Even the best museum educators learn through trial and error. Some exhibitions within natural history museums are a natural fit for the early childhood level. They include opportunities to touch natural objects, sort specimens, or replicate the work of a paleontologist.

However, like schools, museums also struggle with dwindling budgets and may not have the resources to make the changes they know are necessary. When teachers encounter a traditionally designed exhibition hall or read a difficult label for young learners, it can be a frustrating experience for everyone.

With text that may be challenging even to adults and facing limited hands-on experiences, early childhood educators may gravitate to the traditional look-listen model of pointing out content and providing a couple of sentences about what children are seeing. Cox-Petersen et al. (2003) determined that didactic tours such as this can result in children’s low-level gains (the very opposite of teachers’ intentions) and suggest an alternative visit structure that relies on children who actively question and collect data.

Young children can work independently at a museum—precisely the type of interaction that promotes active, minds-on science learning instead of passive experiences. Educators encourage higher-level thinking by asking children to interpret what they see. Children may identify physical differences in the animals or perhaps describe what makes an exhibit interesting to them. Another approach is to have students record their discoveries by drawing pictures in a museum journal. Young children can then dictate a sentence or two to a volunteer to support the message of their picture. Older students can stretch their new writing skills by writing themselves. To encourage verbal communication skills, children can pair up and take turns explaining the discoveries they make at the museum to a partner. All of these experiences enable children to incorporate science process skills that are critical for science literacy (Kallery, 2004).

Another option is for teachers to bring their own hands-on elements in the form of a discovery bag of touchable objects. This might include fresh leaves to touch while exploring a rainforest display or seashells for handling during a visit to a marine biology exhibition.

Combining multisensory elements with a traditional exhibition greatly increases the holding power of the exhibit (Davidson, Heald, & Hein, 1991).

Some museums may not allow large bags or backpacks for security reasons but may offer programming that fulfills this need for hands-on exploration. A quick phone call in advance of a visit will provide information on special programs as well as any restrictions on what teachers may bring with the group.

Make Museum Visits Memorable

Teachers have many considerations when planning a field trip to a science museum with young children. From nametags and bus schedules to lunch plans and emergency contacts, the basic logistics alone are daunting. However, it is critical to look past logistical planning to determine the developmental and cognitive goals of the visit. While a traditionally designed museum may not immediately seem like a match for early childhood, there are amazing learning opportunities that await children in these settings.
Taking care to focus on in-depth experiences, complete with student choice and active involvement, will make any visit both engaging and memorable. Further, taking advantage of the opportunities to view, touch, or discuss rare and priceless objects with children is critical to the development of science literacy. By moving past the small challenges and focusing instead on the exciting opportunities that await the group, possibilities for children’s success become limitless.

References


Put These Ideas Into Practice!

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Characteristics of High-Quality Science Explorations

When planning science learning opportunities—in the classroom, neighborhood, or at a museum—always:

- Keep science experiences short and focused
- Create hands-on activities based on student interests
- Ensure students are actively engaged

Meet Science Standards in a Museum

Abilities necessary to do scientific inquiry

- Guide observation of natural objects. Ask questions that encourage attention to detail.
- Have children record what they see using pictures or words.
- Encourage children to explain what they see.
- Ask pairs of children to describe their discoveries to each other.

Understanding about scientific inquiry

- Point out any displays that highlight the work of museum curators as active scientific researchers.
- Read an exhibit label out loud and ask children to explain how they think a researcher might have learned that information.
- Ask children to indicate what specimens they might like to study if they were scientists.
- Identify an exhibit where several different types of scientists might have worked together.

Take Along a Science Discovery Bag!

Science Discovery Bags are excellent additions to explore almost any topic. Prepare take-home bags to support family adventures. Take along a bag that is tailored to each field experience.

The best Discovery Bags are:

- Open ended
- Hands-on
- Object centered
- Actively engaging

Infant Sensory Bag

Include items with different textures with which an adult can lightly touch children. Craft feathers (purchased), cotton balls, a spray bottle of water, or faux fur from a fabric store are just a few examples.

Toddler Shell Bag

Choose a variety of clean seashells for toddlers to touch, sort, and organize. A large variety of shells demonstrates diversity in nature.

Preschool Animal Matching Bag

Select natural objects related to different animals such as a craft feather (purchased), seashell, piece of snakeskin, wool, or sea star. Include laminated color pictures of the animals to match with specimens. Include some specimens that match more than one picture.

Kindergarten to Grade 3 Classification Bag

Provide a wide range of plastic animals. Challenge students to organize the animals into different groups. Younger students may choose to group by color or by land dwelling/sea dwelling. Older children may classify them as mammals or birds, for example.

Note: Dimensions of Early Childhood readers are encouraged to copy this material for early childhood students as well as teachers of young children as a professional development tool.