

Managing Education Collections: The Care/Use Balance in Natural History Museums

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**Abstract**

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Although many natural history museums across the country manage education collections, not much literature exists on the level of care these collections receive and how institutions make decisions regarding this care. The purpose of this research study was to examine the standards of care for education collections at natural history museums. Using a descriptive case study approach, twelve museum professionals representing four large natural history museums were interviewed. Study results suggest that, while education collections are considered consumable collections, museums enact various levels of care to prolong the usefulness of these specimens and objects, including repair and preventative maintenance. Further, institutions critically consider what it means for objects to be a part of the education collection, in terms of possible damage to the object and potential benefits to learning in the museum. These results will provide a critical lens for museum professionals who use or care for education collections.

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## Chapter 1: Introduction

Many natural history museums have dedicated a portion of their acquisitions to educational purposes, maintaining collections that visitors are allowed to touch and handle. Often called education collections, these collections occupy a liminal space in the museum between conservation and education. On the one hand, these objects and specimens are meant to be handled, which necessarily exposes them to risks such as breakage and wear. On the other hand, these objects and specimens are still artifacts, and need to be preserved for future use and possibly future research. Research collections are preserved and conserved so that they may be available in perpetuity for science; what level of care do education collections receive, and how are decisions made about how to care for such collections? The decisions museums make in answer to this question represent the care/use balance, which is, in short, how a museum provides care for the education collection while also offering those objects for use in hands-on activities. The care/use may include policies, handling guidelines, requirements for educators who want to borrow education collections objects, as well as considerations of the educational use and value of objects in the collection.

Macfarlane and Johnson (2004) believe “the baseline for proper museological practices extends to education collections” (p. 110). They argue that a “well-maintained, researched and displayed education collection can provide more learning value to society than an education collection that is improperly maintained, little researched and underutilized” (p. 102). Macfarlane (2001) further argues that the “education collection should not be a graveyard for misfit objects” (p. 169) but a dynamic collection that conveys a story that reflects the narrative the museum tells as a whole.

More recently, Gavin (2011) investigated the differences of opinion between curatorial

staff and educators about how history museums handle hands-on exhibits. Gavin proposes that both reproductions and education collections have a purpose, with education collections offering the opportunity to engage with something “real,” while reproductions offer this engagement, but also protect the original. She argues that caring for these collections would extend their usefulness, thereby extending their service to visitors for learning experiences and advancing the museum's mission and role in education.

Although little has been written about education collections directly, museum professionals are talking about issues associated with this topic. At the 2014 American Alliance of Museums Annual Meeting in Seattle, two sessions addressed how education collections are managed. The panelists in these sessions who spoke regarding education collections represented several institutions, including the Foss Waterway Seaport, Cincinnati Museum Center, the National Museum of Natural History, and the North Carolina Museum of Natural History. The panelists discussed different ways of approaching education collections care. In general the sessions were structured as times to share what the museums represented had done or were doing with their education collections. In the Managing Education Collections session, specifically, panelists each discussed how they manage the education collections at their institution. The panelists covered how their institutions designate objects for the education collection, including what criteria may be considered, such as if it is too damaged for exhibit, or if it is poorly documented. Some also shared their goals for the education collection, such as more efficient tracking, and housing that will help negate damage from handling.

Education collections are a reality at many natural history museums, and there are conversations happening around their unique care needs, but very little in terms of practical guidelines. The purpose of this research study was to examine the standards of care for education

collections at natural history museums, as manifested in both formal and informal policies and practices. The following research questions informed this study:

1. How do natural history museums care for education collections?
2. How do these museums decide what to incorporate into and what to remove from the education collection?
3. What are the institutional benefits and limitations associated with maintaining an education collection?

Education collections provide an invaluable way for museums to connect with their audiences, especially younger audiences. Handling objects from education collections contributes to the learning that happens in museums (Hein and Alexander, 1998; Talboys, 2005). Currently most of these collections, as far as the literature is concerned, reside in a space secondary to the permanent or research collections, a space where they are not necessarily accessioned, cataloged, tracked, cared for, or repaired when damaged, a space where the idea that they are expendable may determine more of their care than the proposition that they are useful for learning. The results from this study will provide museums with a view of how education collections are managed at several institutions and will offer some considerations museums can make when managing an education collection.

For the purposes of this study, the term 'education collection' refers to a collection of authentic objects and specimens which have been set aside for hands-on use in educational programming. These collections may contain other materials in addition to the real specimens and objects and they may be used for other activities in addition to hands-on education. Education collections in this context are a sub-set of hands-on collections in general, which may include teaching collections maintained by curators and collections consisting wholly of reproductions or replicas. Other types of museums may manage education collections; however,

only education collections at museums which identify as natural history museums are of interest in this study.

## Chapter 2: Literature Review

This chapter provides an overview of the literature relevant to the care/use balance for education collections at natural history museums. Areas of literature reviewed include: collections management standards and best practices; museum education practices, standards, research, and theories pertaining to object-based or object-centered learning; and articles regarding both general field and museum-specific use and care of hands-on collections.

### **Collections Management Standards and Best Practices**

*A Legal Primer on Managing Museum Collections* by Malaro and DeAngelis (2012) serves as the definitive text on the legal responsibilities of museums towards their collections. Malaro, an attorney who once served as a legal adviser to the Smithsonian, and DeAngelis, who served on the Smithsonian's legal team, have both made careers of helping museums understand the law and the legal implications of their actions. According to Malaro and DeAngelis, “a museum should accession only those objects that it intends to retain for the foreseeable future” (p. 59-60) citing various types of collections the institution may maintain. Since objects in education or hands on collections may face destruction through use, Malaro and DeAngelis (2012) imply that these collections ought not be accessioned, and that “transfers from permanent collections to study or 'school' collections should be considered deaccessions, with full documentation made” (p.249). While extensive lists are made regarding what collections management policies should cover, and how much documentation is adequate documentation, little is said about the legal obligations of museums towards education collections. Since it seems that Malaro and DeAngelis (2012) do not believe education collections should be accessioned into permanent collections of the museum due to the destruction they face through use, not much can be inferred from the text regarding how these collections should be cared for in terms of the

requirements of the law.

Malaro and DeAngelis (2012) state that “a museum has a responsibility to provide reasonable care for the objects entrusted to it” (p. 444). This statement can be understood reasonably to refer to all objects which the museum manages. According to Malaro and DeAngelis (2012), the main means for “implementing prudent measures concerning collection care” is the collection management policy (p. 447). The collections management policy explicates the “museum's professional standards regarding objects left in its care” (p.46). The topics covered by a collections management policy should include not only guidelines for acquisition, but for disposal, for care for and access to objects, as well as detailing what and how records should be kept.

Collections policies are commonly regarded as a necessary part of responsible collections management at a museum. In *Things great and small: Collections management policies*, Simmons (2006) emphasizes the importance of a collections management policy. Simmons has experience as a museum studies program director, a collections manager, and a surveyor for the American Alliance of Museums' Museum Assessment Program. Presented as a guide to creating comprehensive collections management policies, Simmons (2006) defines the essential attributes of a collections management policy and spends a chapter on each recommended section of the policy, providing guidance and suggestions of what to include as well as examples of such policies from museums around the country. According to Simmons, a collections management policy is “actually a set of policies that address various aspects of collections management, including acquisition, accession, registration, cataloging, control, security, and storage, as well as the museum's other collections-related activities” (p. 2). Since many museums have more than one category of collection, for example: permanent collections, education collections, and

archives, Simmons recommends that the collections management policy “[define] each category of collections the museum has and [describe] how the collections in that category are acquired and used” (p. 33). How collections are used and how they are cared for should both be addressed in the collections management policy. Simmons suggests that the collections care policy include at least general statements regarding: “staff responsibilities; preventative conservation; handling of objects in the collection; conservation treatments; packing and shipping; special care of sacred or culturally sensitive objects; storage environment; pest control; off-site storage; [and] collection inventories” (p.98). The benefits of a good collections management policy are not to be underestimated, according to Simmons, who asserts that “by enacting and enforcing good collections management policies, the museum's governing authority meets its legal and ethical obligations to protect and provide public access to the collections. Good policies help the museum achieve its mission and demonstrates its commitment to professional standards and practices” (p. 2).

In a later work, Simmons (2010) discusses the various aspects of a collections management policy, including the access and use policy, which “ must balance the requirements for collections care and security with the museum's public trust responsibilities” (p. 28), a sentiment expressed in the American Alliance of Museums (2008) Standards and Best Practices: “Guided by its mission, the museum provides public access to its collections while ensuring their preservation” (p. 16). Museums have an ethical responsibility to make their collections available to the public, some museums choose to do so through education collections, which allow hands-on interaction with objects.

Meador-Woodruff (2010), in her section of *Museum registration methods*, details several ad hoc policies that museums may want to develop for their collections, including one that

applies to “demonstration or instructional collections” (p. 32). She emphasizes that “it is important to clarify which portions of the collections may be used for this purpose—the museum's accessioned permanent collections or only those artifacts that have been designated for demonstration” (p. 32). Since the use of these collections differs from the use of permanent collections, the museum should have guidelines for which objects are available to be used in that way.

*Museum registration methods* provides comprehensive guidelines for collections management and registration professionals, presenting sections written by professionals to address both new and common topics. Very little explicit mention is made of hands-on collections. Morris (2010) mentions educational uses of objects in her section on deaccessioning. She lists “educational and research programs” as a disposal option for deaccessioned collections objects, stating that “it is expected that the objects will be subject to physical deterioration or damage over time” (p. 101). It is this damaging use that precludes the objects from being considered part of the permanent or other accessioned collections in her assessment.

The *MRM5* volume edited by Buck and Gilmore (2010) also addresses storage and preventative care for collections. Storage and preventative care are two sides of the preservation coin. Swain (2010) states that the “goals of good storage are to protect and preserve collections. Disasters, environmental factors, physical damage, and problems caused by poor-quality storage materials all can be mitigated or prevented with adequate planning and information” (p. 293).

Fisher (2010) defines preventative care as:

the mitigation of deterioration and damage to cultural property through the formulation and implementation of policies and procedures for the following: appropriate environmental conditions; handling and maintenance procedures for storage, exhibition, packing, transport, and use; integrated pest management (IPM); emergency preparedness and response; reformatting/duplication (p. 287).

Both of these sections in *MRM5* emphasize the importance of proper planning in terms of care for collections. Swain (2010) argues that “each layer of protection [in storage] increases the longevity of an object” (p. 299). Since museums ostensibly agree to steward their collections in perpetuity, proper storage and preventative care, to ensure the objects last for as long as possible, is prudent. A majority of the material in *MRM5* expands upon and clarifies an American Alliance of Museums collections stewardship standard: “the museum legally, ethically and effectively manages, documents, cares for and uses the collections” (AAM, 2008, p. 16).

In the collections management field, a thorough collections plan is increasingly viewed as a valuable and necessary instrument for a museum. Indeed, the American Alliance of Museums incorporates collections planning into the standards and best practices: “The museum strategically plans for the use and development of its collections” (p. 16). Gardner and Merritt (2004) provide guidelines and a framework by which museums can draft their own collections plan, which attempts to define the scope of the collection in relation to the museums mission. The collections plan attempts to balance current needs with future needs, collections goals with interpretive goals, and passive collecting with planned collecting. Gardner and Merritt (2004) recommend sections of the plan, which include a description of the existing collection and a gap analysis to determine holes in the collection. They emphasize the importance of “plan[ning] intelligently” for acquisitions “within the framework of a carefully developed collections plan” (p. 2) as opposed to passively collecting objects and not ensuring that the objects further the museums mission and public responsibilities. The American Alliance of Museum's collections stewardship best practices standards begin with the mission: “The museum owns, exhibits or uses collections that are appropriate to its mission” (p. 16). It is clear from the standards that the mission should guide all the work of the institution, including the collections.

The museum field widely acknowledges the responsibility institutions have to care for the collections in their keeping, through proper documentation, preventative care, and proper storage. However, the same sources for those guidelines are unclear where hands-on collections fit into this scheme of care. Because they are handled by the public, hands-on collections are at greater risk of damage than permanent collections. If hands-on collections objects are accessioned, the museum has a legal responsibility to care for them in a manner that prolongs their usefulness, just as the museum does for its permanent collection. If hands-on collections objects are not accessioned, the museum still is ethically bound to manage them responsibly, though the literature does not define what this would mean exactly, leaving it to each institution to determine.

### **Learning with Objects and Object-centered Learning**

A glut of literature exists regarding learning in museums. For the purposes of this study, the most relevant literature regarding learning in museums is also that which emphasizes the role of objects and interaction with objects. A significant portion of the literature reviewed directly addresses object-centered learning while the rest discusses more general practices of education related to objects. This literature provides a background for understanding why museums maintain education collections and what the benefits are of learning experiences with objects.

In 1992, the *Excellence and equity* publication by the then American Association of Museums emphasized the preeminence of museum's educational role. For AAM, this educational role is inextricably tied to museums' public service. According to the report "museums perform their most fruitful public service by providing an educational experience in the broadest sense: by fostering the ability to live productively in a pluralistic society and to contribute to the resolution of the challenges we face as global citizens" (p. 6). Excellence and equity refer to the

two aspects of this responsibility:

By making a commitment to excellence in public service, museums can assure that decisions about collecting, exhibitions, programs, and other activities are supported both by rigorous scholarship and by respect for the many cultural and intellectual viewpoints that museum collections stand for and stimulate. By making a commitment to equity in public service, museums can be an integral part of the human experience, thus helping to create the sense of inclusive community so often missing in our society. (p. 6)

*Excellence and equity* is about engaging the whole museum—from security staff to directors, from research to public programs, and everyone and everything—with its role as an educational and public service institution. It must be remembered that this report emphasizes both an inclusive definition of education, not just education as programs for school-age children, and that the entire museum must work towards public engagement.

Using five categories (education as entertainment; education as empowerment; education as experience; education as ethics; and education as narrative endeavor) and experience of planning the Linnaeus exhibit at the Chicago Botanical Garden, Roberts (1997) explores the changing paradigm of education in museums, evaluating a myriad of correlated changes, such as the shifts in theories of knowledge and the ethics of providing multiple interpretations. She encourages museums to construct narratives that foster engagement of their visitors. In her chapter on education as experience, Roberts touches on authenticity and interaction, and the contradiction of participation and real objects in the context of the exhibit development. Roberts concludes the chapter with the assertion that the “reality” of an object is more about the “reality” of the experience, which is mediated by a “wider context of signs that give meaning to that reality” (p. 102), than it is about the object itself. In the context of interaction, this would value an authentic experience over an authentic object.

Hein and Alexander (1998) discuss various ways that museums are places of learning,

based around educational theory, museum education practice, and visitor studies research. Since it is widely acknowledged that museums are educational, the authors set out to define in what ways. They contrast didactic and stimulus-response education with discovery education and constructivism, arguing that the first two are incremental and the second two are active. Their focus on active learning has relevance for this study. They discuss how the “linking of active learning with a realist position on knowledge—the combination of the opportunity for the learner to discover truth by 'finding out for herself,' to 'learn by doing'--is a natural approach for museums, since museums value objects and learning from objects” (p. 41). Since active learning (constructivist or discovery) incorporates both the hands and the mind, Hein and Alexander go so far as to say that “physical interaction with the world—building something, solving a puzzle, handling objects, or otherwise engaging with the 'stuff' of the world—requires the learner to struggle with ideas, that is, to think” (p. 38). Hein and Alexander conclude that “learning occurs in museums through the interaction of visitors with objects and programs provided to them” (p. 44), a conclusion which implies the importance of the programs and objects presented.

Rowe (2002) describes a social constructivist view of how people, especially children, make sense of objects and engage with objects to make meaning. Using transcripts from his study at the St. Louis Science Center, Rowe (2002) discusses how interaction with museum objects, in this case interactive exhibits not collections objects, facilitates the visitor's or user's meaning-making. He concludes that “the goal of museum education is to invite visitors into the meaning-making experience, drawing on what they know and the alternative possible meanings museum objects afford and multiple ways of interacting with and around objects” (p. 33). Rowe, like other authors, does not limit the meaning of an object to its inherent characteristics, but includes what the visitor brings to bear.

Paris and Hapgood (2002) examine how children's experiences in informal learning environments can contribute to their social and cognitive development by exploring the features of informal learning environments, what children can learn with objects, and how they make meaning among other things. Similar to Rowe, Paris and Hapgood emphasize the importance of a visitor's interaction with an object with respect to meaning-making: "Viewing the objects allows visitors to recreate and embrace their personal memories, to express their ownership of the experiences, and to share the stories with others" (p.44).

Evans, Mull, and Poling (2002) investigate the importance of authentic objects when it comes to children learning in museums. They discuss the shift from object-based epistemology, which favors the voice of the curator, to object-based dialogue, which incorporates the visitor's perspective. They discuss the naive theories of children and the ways in which children perceive authenticity of natural and man-made objects. Evans et al. conclude that, "insofar as children are reared in an increasingly artifactual world, object-centered learning in museums has the potential of grounding (literally) their experience of reality" (p. 74).

Building on this discussion of authenticity, Callanan, Jipson, and Stampf Soennichsen (2002) discuss the way children develop and understand symbolism. They emphasize that the more salient a representational object is—that is, the more an object can be understood as itself and not as a representation of something else—the later in development children understand it as a representation. The authors emphasize the importance of interaction in their article, both between the parents and children they studied and between visitors and the objects in question. In their study, the parent-child interactions informs the children's understanding of representative objects "both as objects and as symbols for other (more abstract) objects" (p.281). The way children interacted with the representational objects of maps, globes, and video, indicated

whether they perceived the objects as objects or symbols.

Van Kraayenoord and Paris (2002) draw an analogy between reading texts and reading objects. Not only do “visitors look at and examine objects to determine their qualities,” but “the individual object, like a book, may be easily read or may be difficult to interpret...What is apprehended from the encounter with text or object depends on the processes applied by the person” (p. 223). The authors assert the importance of making sense of objects and providing the Four Resources Model of Literacy (originally formed from the reading of text) to guide the reading of objects. The four components of the model (codebreaking, participating in text, using text, and analyzing text) can all be applied to reading objects as readily as to reading texts, illuminating a possible path for visitor interaction and interpretation.

Morrissey (2002) focuses on some of the ways visitors encounter objects and how these encounters can be direct or mediated by others. The mediation involves five possibilities, which Morrissey explicates in her definition of the Pathways Model: Pathways among objects and museum visitors. Like other authors in the object-centered learning field, Morrissey champions the belief that objects are not valuable just for who made them or what they were for, etc., but for what visitors can gain from interacting with these objects. Ever increasingly the museum is becoming about the visitor, as Morrissey says, “museums today are challenged to use objects to help us all more clearly see not only the special qualities of objects, but the special qualities of ourselves and our relationships to others—to use objects to increase and strengthen the pathways between ourselves and others and between ourselves and our communities and our landscapes” (p. 299).

In the *Manual of museum learning*, Lord (2007), Haas (2007), and Maximea (2007) discuss interaction with objects. Lord (2007) introduces the topic at the beginning of the volume,

suggesting that other institutions can learn from science centers and children's museums which have an “emphasis on learning by doing” (p. 18) rather than on learning by observing. In his opinion this emphasis “requires touching and therefore generates a need for replicas or models rather than original objects” (p. 18). In a subsequent chapter, Haas (2007) offers two case studies of museums who have developed innovative spaces for children and families, making museums focused on learning and creating family friendly spaces and putting on family-oriented programs. Both of these case studies focus on the development of an “open learning environment” (p. 50) in the museum as a whole, including “hands-on areas in exhibitions targeted at younger children” (p. 72). Unlike Lord, Haas does not emphasize the use of replicas, but cites “museums [which] offer research labs allowing direct contact with specimens and artifacts in a separated area” (p. 72) as examples of successful inclusion of interactive spaces. Later in the same volume, Maximea (2007) discusses the types of spaces needed for museum learning programming based on both the type of programming and the ages of the participants. While the recommendations differ for each age group and each type of program, she works from the belief that “beyond access through gallery display and interpretation, opportunities for hands-on contact with real objects from the collection are highly valued by visitors” (p. 184). She makes this clear through her discussion of the variety of learning spaces in museums, including space for the loaned collection and the activities which support sharing these objects with the museum's community.

Talboys (2005) provides a comprehensive overview of the role of education and educators in museums, including resources and citations. He discusses how visitors interact with the museum and how the museum can determine which services to provide in order to serve its constituents best. The *Museum educator's handbook* makes more mentions of hands-on (called handling) collections than the other literature discussed in this section so far, usually

incorporating such discussions with recommendations for educators. Early in the volume, Talboys (2005) addresses the “apparent dichotomy that exists between conservation and education...[namely] the fear that you cannot possibly use artefacts for education *and* stick to the high standards of conservation demanded by curatorial staff” (p. 19, emphasis original). He asserts that:

Once it is understood by curators that one of the aims of museum education is to teach about the value and fragility of the resource, much of this conflict should be resolved...after all, if a resource is damaged or destroyed, it can no longer be used for education. It is, therefore, in the interest of everyone to conserve the resource. At the same time, it must be remembered that the whole purpose of conserving the resource is to make it available for education (pp. 19-20).

Throughout the volume, Talboys emphasizes authentic objects, often referring to them as genuine. He believes that the “psychological impact of proximity to or contact with genuine artefacts reaches deep and cannot be reproduced using text or pictures,” and he makes much of the “human connection – the fact that a student can handle and examine an artefact that was made and used by a real person hundreds, thousands, or even hundreds of thousands of years ago” (p. 83). Talboys suggests various ways for educators to engage visitors with objects, including activity-based sessions, handling collections, and loan services. He acknowledges there will be damage to the objects, “wear and tear on materials means that they will have to be replaced on a regular basis” (p. 122), but, given the emphasis he places on the impact working with and handling genuine objects can have, Talboys considers it a reasonable expense.

Most object-based learning literature seems to agree that there is just something about interaction, related to constructivist theories of knowledge. They also agree that there is something about authentic objects, though this something is less well-defined. Talboys suggestion of the “human connection” that can be made holds for artifacts made by humans, but less so for fossils or other objects that are not man-made. The idea that interactions with real

objects are conducive to learning forms the foundation on which education collections are built. Those authors who discuss using authentic objects often do acknowledge the challenges that this entails, whether it is convincing the curators or preparing to face the damage to an artifact from handling. Such challenges are relevant to any consideration of education collections, which subject authentic objects to damage by handling in order to benefit learning. Further, throughout the literature there is also an emphasis on the educational role of museums, either in the broad sense of AAM (1992) or in a narrower sense of specific programs. This emphasis also undergirds education collections. Many museums have determined that, in order to engage their public, they will use their collections in an interactive manner, providing for learning. This is a consequence, though not a negative one, of a whole museum commitment to public service.

### **Hands-On Collections**

Not much of the literature directly addresses the unique situation of education collections, and even less pertains to the status of these collections at natural history museums. Literature regarding hands-on collections in general (of which education collections are one) has been examined to broaden scope of the literature in this section. Due to the lack of literature that explicitly addresses education collections at natural history museums, literature that discusses hands-on collections in general and education collections at a variety of institutions has been examined.

An early discussion of hands-on learning in museums can be found in Val Balgooy (1990), an opinion article regarding the increase of hands-on activities in museums and the strain this can cause, since “hands-on activities can enhance learning but also accelerate the destruction of artifacts” (p. 125). Van Balgooy opines that, rather than creating multiple collections for curators and educators, museums should develop a system by which the collection can function

as a whole while still providing for preservation and protection of the artifacts. Van Balgooy suggests using three criteria to determine which objects should go where in the collection: significance, the object's "physical limitations," and the "user's qualifications" (p. 126). He concludes by proposing that museums reexamine the role of the educator and the division of objects and knowledge in museums. Van Balgooy believes that "education should not be reduced to strategies of teaching or learning only; much more vital is the management of education in which research and teaching are seen as parts of a common goal" (p. 129). To this end, he suggests in his conclusion that educators and curators should not further divisions in the museum between their two departments and realms of responsibility, but rather seek to work together in order to incorporate teaching and research together into the educational activities of the museum.

Eberbach and Crowley (2005) studied the interactions of visitors with virtual, model, and living plants at a botanical garden, evaluating the importance of hands-on, interactive experiences. In alignment with Evans, Mull, and Poling (2002), Eberbach and Crowley suggest that "an object's authenticity is less essential to learning in comparison to its potential to support visitor participation" (p. 318). They discovered through their research that the different types of objects (plants and representations of plants, in this case) supported different types of meaning making between parents and children. However, they encourage more research into the authenticity of objects and the role that plays in the "unique contributions of museum objects to learning," suggesting that such knowledge would "help museums create more powerful and authentic learning experiences" (p.333).

Keene (2005) discusses the expanding and changing role of collections in museums, including the use of collections for research, education and learning, memory and identity, creativity, and enjoyment. While her main focus is non-touch uses, she believes objects can be

used for learning, and occasionally mentions touch uses. Keene asserts that if museums “want to justify their collections then they must offer service to people to make use of them as the heart of their purpose” (p. 9). This emphasis on the people outside of the institution echoes the thesis of AAM (1992) in their publication *Excellence and equity*. Keene (2010) declares that a “balance has to be struck between access and use, and preservation” since collections are “a public resource for the long term” (p. 31). She expresses some belief that more use of collections for education purposes would help to solve the problem of a care/use balance, arguing that:

A greater use of collections and objects in education could transform collections practice, purpose, and their recognition in society...Special attention would need to be paid to preventing damage and deterioration of collections. But a useful collection is a well looked after collection (p.79)

Keene agrees that handling objects poses a danger to them, but also discusses the benefits of interactivity, including the idea that “multiple sensory inputs – sight, hearing, touch, and feel – are particularly valuable in learning, and objects can provide these” (p. 68). It is her opinion that “properly managed collections are the foundation for any use” (p. 180). For Keene, this “proper management” extends to even those “objects that are designated as semi-disposable, or at least that have special protection” that compose hands-on collections (p. 74).

Shane Macfarlane (2001) assessed the state of care of the education collections at the Lubbock Lake Landmark in Texas, including if the story they told echoed that of the museum and whether or not the collection was stored in a manner conducive to preservation, as part of his graduate studies in museum science at Texas Tech University, leading to two articles: Macfarlane (2001) and Macfarlane and Johnson (2004). Macfarlane (2001) developed an improvement plan for the Lubbock Lake Landmark education collection, identifying eight problems in two categories: exhibition/education and administrative. Macfarlane found that the “objects in the education collection are not educational from a traditional museum exhibit or collection

management standpoint” (p. 169) being, perhaps not all at once, without provenance, broken, and outside of the scope of the Landmark. Macfarlane (2001) argues that the “education collection should not be a graveyard for misfit objects” (p. 169) but instead a dynamic collection which conveys a story reflective of the narrative the museum as a whole tells. Before his project with the education collections, the objects largely lacked documentation and information, did not tell a coherent story, and were organized haphazardly as a result. The administrative problems included the fact that no recent inventory had been done, that the objects received little to no conservation or preventative conservation, and that no limits were in place to restrict the growth of the collection. In response to the eight problems he outlines, Macfarlane (2001) developed a “five-step procedure which involves: theme building; collection assessment; cataloging; object arrangement; and collection housing” (p. 170). He suggests this can serve as a template for the management of education collections in general. In addition, he makes several further general recommendations, including the need to regard the education collection “from both an exhibition vantage and a collections management vantage” (Macfarlane, 2001, p. 173) in order to make the best use of the collection. These recommendations and the template for education collection management have informed this study by providing insight into what one institution has done and why.

In a later article, Macfarlane and Johnson (2004) present a practical follow-up to Macfarlane's earlier article focused on the collections management issues of the education collection at the Lubbock Lake Landmark. They echo several of Macfarlane's sentiments in the earlier article, stating that a “well-maintained, researched and displayed education collection can provide more learning value to society than an education collection that is improperly maintained, little researched and underutilized” (p. 102). They discuss the failure of the Lubbock

Lake Landmark to maintain education collections which reflected the scope and story of the permanent collections previously, and how they rectified this situation by determining a theme for the collection which matched the mission and research of the Lubbock Lake Landmark, “Humans and Their Adaptations to a Changing Environment.” Even though the education collection is meant to be handled by the public, leading to damage, Macfarlane and Johnson (2004) believe that “the baseline for proper museological practices extends to education collections” (p. 110), arguing that care for these collections would extend their usefulness, thereby extending their service to visitors for learning experiences and to advance the museum's mission and educational role. They developed a “collections management methodology...[that] consisted of: creating a scope of collection; object identification; cleaning; cataloguing; stabilization; housing and storage; inventory; and a gap analysis” (p. 104). Developing this methodology allowed them to cull about half of the existing collection that did not fit the theme or scope, to acquire new objects identified by the gap analysis, and to formally accession the objects with documentation as the Landmark's collection management policy mandates. As a result of these two projects, the education collection “now resembles a permanent collection in terms of its care and management” (p. 108).

More recently, Gavin (2011) investigated the differences of opinion between curatorial staff and educators regarding the care/use balance in terms real objects (permanent and education collections) and reproductions. She proposes that “one creative method of keeping the attention of visitors is tangible interaction with objects on display” (p. 156), but determined that the duties of curators and educators may conflict when hands-on interaction is allowed with objects. In order to address this question, Gavin conducted a survey of eleven museums in Fredericksburg and Richmond, Virginia, including “both publicly and privately funded museums, large

institutions, small house museums,” and other museums, to address her question of “how history museums in particular deal with hands-on exhibits” (p. 157). She contacted fifteen institutions and sent short surveys to the curator and the educator at the eleven institutions who agreed to participate. She also conducted case studies at three institutions in order to “find clearer explanations for each museum's education and interpretation methods” (p. 157). After interviewing museum professionals at a selection of museums in Virginia, Gavin (2011) found that, “although the majority of professionals acknowledged that interaction with objects proves to be successful at educating the public, many museums in this study have not sought out ways in which to incorporate these techniques into their museum” (p. 161). In terms of how the museums incorporate interactivity, Gavin found that “only one-third used reproduction objects” (p. 159) and the same percentage employed education collections. She concludes that “although the majority of professionals acknowledged that interaction with objects proves to be successful at educating the public, many museums in this study have not sought out ways in which to incorporate these techniques into their museum” (p. 161). Gavin proposes that both reproduction objects and education collections have their place in interactive exhibits at museums since each afford visitors the opportunity to interact with objects. Education collections have the distinction of offering “real” objects, but Gavin also sees the benefit of reproductions, which provide a “wonderful way for the public to understand something better, and protect history at the same time” (p. 159). Since the key for Gavin is interactivity, she supports the use of both reproductions and education collections.

Finally, Smith (2011) explains how, “for sixty-plus years, offering hands-on experiences with artifacts has formed the foundation of the Fort Worth Museum of Science and History, and that concept has evolved into a dual mission: to preserve artifacts and to make them available to

visitors for hands-on opportunities” (p. 140). The Fort Worth Museum of Science and History has developed two collections in its history, a teaching collection that is touchable, and a permanent collection that is non-touchable. The museum legally owns both collections, but the collections have separate housing and different criteria for acquisition and disposal or replacement. Smith (2011) acknowledges that adherence to this mission not only “strain[s] the Collections department,” but “necessitates an ever increasing portion of [the museum's] budget to be allocated to conservation and purchasing replacement items” (p.144). Despite the challenges of this approach, Smith states that “providing these hands-on artifacts in a rich learning environment permits children to make a tangible connection to the past. It also reinforces critical thinking and completes the educational activity through learning by doing, which represents a concrete form of learning and forms a foundational principle of this museum” (p. 144), making clear that, for the foreseeable future, the Fort Worth Museum of Science and History believe that the benefits of maintaining their unique hands-on collections outweigh the costs, monetary or otherwise.

In general, the authors of this portion of the literature agree with and support the idea that interaction with objects has an impact on visitors, and not just on what and how they learn. Gavin argues that interaction can engage visitors, affording them a “connection with the items” (p. 156); Keene discusses the multisensory nature of interaction as valuable to learning. Macfarlane, Macfarlane and Johnson, Keene, and Smith emphasize that caring for the collections is not excluded due to hands-on use. They acknowledge this poses a challenge, but Smith is convinced of the benefits of a hands-on approach, as are Macfarlane and Johnson. Macfarlane and Johnson advocate treating education collections as much like the permanent collections as possible, in terms of policies, storage, accessioning, and more, in order to ensure the relevance of

the collection to the museum and to maintain the collection as well as possible, minimizing risk to the objects and reducing the need for replacement. Keene also champions well-managed collections, regardless of their use.

### Chapter 3: Methods

The purpose of this research study was to examine the standards of care for education collections at natural history museums, as manifested in both formal and informal policies and practices. The following questions informed the study:

1. How do natural history museums care for education collections?
2. How do these museums decide what to incorporate into and what to remove from the education collection?
3. What are the institutional benefits and limitations associated with maintaining an education collection?

This study utilized a case study design with two methods: 1) semi-structured interviews; and 2) document analysis.

#### Sampling

**Case study museums.** In order to identify potential case study museums, the researcher searched Guidestar for natural history museums and eliminated immediately those with budgets under \$5 million. Institutions with larger budgets were sought with the idea that institutions with larger budgets would have more choices regarding how to care for these collections, and thus could represent the leading edge of how these collections are managed. One institution not listed on Guidestar was added to the candidate list, due to its status as a large natural science institution with education collections. The candidate institutions were evaluated for: regular use of education or hands-on collections; and the accessibility of information about the education collections institution's website. Once done, several institutions remained. Of these institutions, the researcher chose three initially because she had a contact at each one. After hearing back positively from all three, the researcher contacted two further institutions. Of the two institutions contacted later, participants responded from one. Professionals representing four case museums participated in this study.

**Professional participants.** Participants were sampled based on the fact that they currently work for one of the selected institutions and either currently work with the education collections or used to work with the education collections as either collections management professionals or educators. Potential participants were emailed a brief description of the purpose of the study, the process of the interview, and an explanation that their involvement was completely voluntary. Fourteen individuals were contacted, thirteen directly through e-mail addresses obtained from the museum's website, personal acquaintance, or reference from another participant. Twelve responded; of those twelve, all agreed to participate in the study.

### **Data Collection & Analysis Procedures**

**Interviews.** Semi-structured interviews were conducted with participants, allowing them to convey their experiences with education collections and the policies surrounding such collections at their respective institutions.

Interviews were conducted over the telephone and lasted approximately forty-five minutes. Interview questions investigated the institution's use of education collections and any implementation of care for the collection. All interviews were digitally recorded. The interview guide is contained in Appendix A.

Interview data were analyzed using emergent coding. The coding highlighted intriguing aspects such as novel approaches of museums to their education collections while also using the literature background as a guide. Once all interviews were coded, the researcher categorized the responses to identify differences, similarities, and other factors of note. The rubrics used to code interviews are included in Appendices B, C, and D. Each coding rubric corresponds to a research question: Appendices B, C, and D correspond to Research Questions 1, 2, and 3, respectively.

**Document analysis.** Document analysis provided the researcher with the formal policies

and procedures of the institutions with respect to their education collections. Analyzing the documents not only provided the researcher with the language used in the field, but "represents data to which participants have given attention" (Cresswell, 2014, p.192).

The researcher asked all study participants to share their institution's documents and policies related to education collections including, but not limited to, education collections specific policies and general collections policies. The researcher did not code the documents but referred to them when in need of clarification of material stated in the interview.

### **Limitations**

This study has four main limitations. To begin, the case study format has certain inherent limitations, including an inability to be generalized to the field at large. The data collected represent practices at these four institutions in depth, but do not necessarily reflect the practices in the field at large. The results from this study can be used to start a conversation about practices in education collections management.

Two limitations relate to the criteria used to select case study sites. These criteria were that these would be natural history museums with large budgets. Natural history museums were selected in part because these were the museums more heavily represented in the sessions on education collections at the American Alliance of Museums conference in 2014. Larger institutions were selected because of the presumption that a larger budget meant that museums were more likely to have the discretion to innovate in the care of the education collections. Smaller institutions with restricted budgets were not looked at for this study under the same presumption.

Finally, after narrowing possible sites, in order to choose case study sites, those sites at which the researcher had a preexisting contact were given precedence (i.e. the National Museum

of Natural History, the North Carolina Museum of Natural Sciences, and Cincinnati Museum Center). Because of this, other sites which made the list of candidate sites were ranked lower on than they would have been if the researcher selected sites using another type of preference. Also, since sites were chosen this way, and since the contacts at the sites were made at the American Alliance of Museums conference in 2014 from panelists and audience members at the education collections sessions, these museums may not represent the broadest swath of potential practices in the field. However, because these three sites had participated in the conference discussing how they handled education collections at their institution, it was assumed they may be more willing to participate in the study.

## Chapter 4: Results and Discussions

Four case study institutions were chosen: the Cincinnati Museum Center; the North Carolina Museum of Natural Sciences; the Denver Museum of Natural Science; and the National Museum of Natural History. Through interviews with collections and education staff at each institution and analysis of policies and other written documents relevant to the education collections provided by these participants, data were compiled to address the three research questions of this study. This section begins with a brief introduction to each case study site, including a history of the education collections at the site, and then presents the findings, according to each research question.

### Case Study Descriptions

**Cincinnati Museum Center.** A merged institution based in Cincinnati, Ohio, the Cincinnati Museum Center initially emerged in 1996 following the merging of the Cincinnati Museum of Natural History, the Cincinnati Historical Society, and the Cincinnati Children's Museum. The Cincinnati Museum Center “inspires people of all ages to learn more about the world through science; regional history; and educational, engaging and meaningful experiences.” The institution has been operating the education collection in its current form for at least fifteen years, since after the institutions merged. The education collection started as a way for curators to “set aside materials that were part of the collection that they didn't want to get rid of entirely, but wanted to find a better use for within the context of the museum,” such as to benefit programming and education, said one participant. The education collection attempts to represent the permanent collections at the museum, since “each department identified artifacts within its own collections to add to the education collection,” according to a study participant from that institution.

**North Carolina Museum of Natural Sciences.** Located in Raleigh, North Carolina, the North Carolina Museum of Natural Science operates two hands-on collections, the Naturalist Center and the Teaching Collection. The museum was originally founded in the mid-1800s, and has operated the Teaching Collection since 1977 and started the Naturalist Center Collection in 2000. The creation of both of these collections relates to the hands-on programming at the museum. The Teaching Collection started the same year the museum “had the first organized hands-on programs for school groups,” according to a study participant. The Naturalist Center Collection began in 2000 with the opening of the Naturalist Center, created in order to “have a collection that was hands-on for the public.”

**Denver Museum of Nature and Science.** A large natural history museum in Denver, Colorado, the Denver Museum of Nature and Science was founded in 1900. The museum's mission is: “Be a catalyst! Ignite our community's passion for nature and science.” Pursuant to this mission, the museum has had an education collection since the 1970s, but the collection was formalized in 1989. At this point in the late 1980s, the museum decided to formalize the collection in order to ensure the “resource was well taken care of,” which involved not only tracking and monitoring the collection, but ensuring that the museum abides by any federal regulations that apply to the objects in the collection. The education collection was built “to cover all the museum's disciplines,” said one participant, indicating that “it covers a very broad scope, but...obviously not as in depth as the research collections.” In addition to items that reflect the research collections, the education collection at the Denver Museum of Nature and Science also has a “very small museology collection, things about...how animals are taxidermied or how dioramas are made” and some “objects that were used for traveling exhibits.”

**National Museum of Natural History.** A member of the Smithsonian Institution in

Washington D.C., the National Museum of Natural History opened in 1910. The museum's mission is to increase knowledge and inspire learning about nature and culture, through outstanding research, collections, exhibitions, and education, in support of a sustainable future. Hands-on collections have existed at the museum since the mid-1970s, starting with the Naturalist Center at Natural History and the Discovery Room, which both “had collections that were used specifically for the public and specifically for those education centers.” Since that time, the National Museum of Natural History has centralized its education collection under the Office of Education and Outreach and recently opened the Q?rius exhibit, which includes a hands-on collections area. The scope of the education collection represents the seven research collection disciplines at the National Museum of Natural History: anthropology, botany, entomology, invertebrate zoology, mineral science, paleobiology, and vertebrate zoology. The portion of the collection in Q?rius is also a “representation of what is contained within our research collections,” according to one participant. Another participant indicated that the Office of Education and Outreach intends to thus echo the museum's research collections. She said: “we try...when we are developing education collections for them to reflect the museum's collection.

### **Research Question 1: How do natural history museums care for education collections?**

Participants from all case study museums were interviewed using the interview guide in Appendix A, which contained 18 questions designed to elicit information about how these museums care for their education collections. The instrument included questions like “What are (Name of Museum)'s practices regarding repair, replacement, and disposal (or deaccessioning)?” and “What are (Name of Museum)'s goals in using the education collection?” and other similar questions. Once all the interviews were conducted and transcribed, the researcher coded the transcripts and looked for emergent themes, such as innovative approaches to reconcile care and

use of the hands-on collections in question.

To address research question 1, interview questions directly queried the policies used in managing the education collections, the acquisition practices, storage method, and general standards of care. Coding of relevant responses revealed six major themes: a) the nature of policies guiding the standards of care for education collections; b) specific care practices which focused mainly on discussions of storage; c) the legal and stewardship issues that the museums face with regards to the education collections they operate; d) preservation measures undertaken for education collections; e) methods of managing the use of education collections, including guidelines and training; and f) considerations around acquiring or accessioning education collections objects.

**a) Guiding policies.** All four case study museums reportedly have policies of some kind that guide the care of their education collection. Though the nature of those policies varies, they provide guidance for these museums to use and care for their education collections. Of the four case study institutions, two, the Cincinnati Museum Center and the Denver Museum of Nature and Science, have education collections management policies which are part of or incorporated into the institutional collections policies. At Cincinnati Museum Center, the education collections “are a subset of our traditional collections management policy.” In addition to this larger collections policy, the Cincinnati Museum Center also has a short two-page document designed for staff and volunteers who will be using the collection with visitors. This document summarizes the way the education collection grows and details the procedures for using it. At the Denver Museum of Nature and Science, the education collections manager developed the education collections sections of the museum-wide collections policies manual and the education collection section of the institution's long-term collections growth plan. According to a study

participant at DMNS, the education collection “adhere[s] as close as we can to our long-term collections and research plan and our research and collections policy and procedures.”

The education collection investigated at the National Museum of Natural History is managed by the Office of Education and Outreach, which has a policy specifically for its education collection. This policy is separate from the collections management policies for the research collections, but “is in alignment with the museum's research collections policy.” As a member of the Smithsonian Institution, there is trickle-down in terms of collections policies, such that the Office of Education and Outreach policy reflects the NMNH policy which in turn reflects the policy of the Smithsonian Institution overall. Changes to the education collections policy would most likely come if changes were made to the Smithsonian policy and then to the NMNH policy.

At the North Carolina Museum of Natural Sciences, policies govern each hands-on collection, both the Teaching Collection and the Naturalist Center, though those policies differ. The Teaching Collection guidelines are mostly concerned with use, i.e. how to borrow and how to handle specimens. According to a Teaching Collection representative, “We have some things that are written out, and some things that are not, but basically we try to take a proactive strategy, including guidelines for users and how specimens are to be used.” The Naturalist Center collections management manual is more extensive, discussing how to catalog specimens and devoting a significant volume to preparation of specimens. While the Naturalist Center collections management manual is separate from the collections policies for the research collections, according to a study participant, “in many ways we [the Naturalist Center] follow the policies that are outlined by our research curators and research collections.”

**b) Storage.** Common to the care practices of all four institutions was the theme of

storage, although sites discussed it differently and had different approaches, representing a diversity of potential practices. In the literature, storage is addressed in terms of what it can do for the preservation of objects. According to Swain (2010), the “goals of good storage are to protect and preserve collections. Disasters, environmental factors, physical damage, and problems caused by poor-quality storage materials all can be mitigated or prevented with adequate planning and information” (p. 293). Swain (2010) argues that “each layer of protection [in storage] increases the longevity of an object” (p. 299). To what extent this level of protection extends to education collections varies among the case study institutions.

At the Cincinnati Museum Center, the ways objects are stored is determined not by whether they are part of the education collection but by the part of the education collection to which they belong. Cincinnati Museum Center has both an accessioned portion of the education collection and an unaccessioned portion. In general the accessioned portion consists of items which were accessioned historically into the research collections which are now designated as education objects. The unaccessioned portion includes specimens and objects acquired for the education collection more recently, which are sometimes duplicates of objects in the research collections. Accessioned education collections objects are kept in the research collections storage area, proximate to their respective research collections and distinguished from research specimens and objects by location. One study participant described the situation:

The majority of the accessioned artifacts still live in our collections storage area, each collection has its own area in our, we have a separate collections storage facility... So all of our paleontological specimens are kept in a separate cabinet, separate education collection cabinet or shelving... where they're pre-sorted out and relatively easy for the person who manages the ed collection to access them along with the curators...

The unaccessioned portion of the collection, however, is stored less formally in a room distinct from the research collections storage. These objects and specimens are often kept in boxes that

are not archival. According to a participant:

If it's in the education collection and that's managed by the education staff then I think he's got those in things like Rubbermaid containers that are, or boxes that are, locked, in locked cabinets, in locked rooms, storage rooms... They're not archival boxes, they're Rubbermaid containers. They're not wrapped or not contained in archival tissue. It won't be in a Delta cabinet, it'll be in a storage cabinet or on a shelf.

This method of storage is “really designed for use by the education staff and so, if they have a particular program they might group a bunch of fossils together so they just have to pull them out when they want to use them.”

The two hands-on collections at the North Carolina Museum of Natural Science also are stored using different methods. The Teaching Collection storage is less formal, similar to the unaccessioned education collection at CMC. The Teaching Collection utilizes “a combination of open metal shelving and cabinets with doors.” Some items are kept in containers, and “anything that's damageable by pests is in cabinets that are pretty bug-proof.” The Teaching Collection Storage, like most of the storage spaces discussed by participants, is not a publicly accessible space. The Naturalist Center collection, in contrast, is a publicly accessible space, and the storage methods reflect the need for access to the collection in this area. The collection is stored in the Naturalist center, which is one large, publicly accessible room, and many items are in Delta cabinets, which is a brand of standard museum cabinetry. “Visitors can open and close” the cabinets to access specimens. Because of the variety of specimens and the variety of activities in the Naturalist Center, storage methods vary. Some of the means of storage are meant to indicate the level of interactivity recommended for the object, like whether or not it can be directly handled. According to a participant who represents the Naturalist Center:

Some of the specimens are just exposed, they can be just handled directly, others are kept in plastic dishes and plastic tubes in boxes, so we have a variety of what is the specimen is sitting in that drawer and whether or not it's direct contact (the

public may touch an object) or it's indirect, in a box that they can see into but they can't actually touch the item.

When objects are too fragile for direct handling, they are stored in boxes that the public can see into but not open.

At the National Museum of Natural History storage methods again differ by the part of the education collection. The Q?rius collection at NMNH is a portion of the education collection operated by the Office of Education and Outreach and designated for use in the Q?rius exhibit collections area. Like the Naturalist Center at NCMNS, this is a publicly accessible space, so collections storage reflects both the need for access and the need to manage use and handling to prevent unanticipated damage to objects. Within the collections area of the Q?rius exhibit, the items are stored in cabinets and in drawers. Within these drawers, specimens are housed in specialty boxes with tags that indicate whether or not the box can be opened to access the object inside. One study participant summarized this situation:

If the tag is green, they can open the lid on the box and take the object out. If the tag is yellow there's, they don't know but we've velcroed the lid shut, so they can't open it, but a volunteer knows how to open it, get past the velcro. If the tag is red, it has been glued shut and they won't be able to open it.

The majority of the education collection operated by Education and Outreach is stored in a dedicated room in a part of the museum that is not accessible to the public. In this area most of the collection is stored in cabinets. While aspects of this collections storage space, like environmental controls and security, are somewhat lacking, "for the most part everything is within cabinetry...and the ones, items, that we haven't been able to fit into storage are covered in a crude plastic or other covering to prevent any kind of problems with, that you may in any building you're going to have dust, you're going to have leakage."

Unlike the Naturalist Center at NCMNS and the Q?rius collection at NMNH, the Denver

Museum of Nature and Science collection is not stored in a publicly accessible space. The education collection at DMNS is concentrated in one storage space within the museum, unlike the education collections at NMNH and CMC. The Denver Museum of Nature and Science tries “to implement best practices in terms of storage,” according to one interviewee, who elaborated on how they do so: “We store these [collections] in museum grade shelving units, and we also make mounts for them... We also do use things like Volara, we use blue-board or archival board... we try to stick... as close as we can to conservation graded material.” This interviewee also stated that, while they prefer to use archival materials, “I don't also stress too much about materials when it comes to storage because any off-gassing or anything like that that's going to happen in storage or from materials they're stored in is vastly outweighed by the fact that we're just allowing ten-year-olds to touch the stuff.” While these four museums do use different storage practices, they all have made conscious decisions about how these objects and specimens are stored, whether that reflects a need for access by educators, as at the Cincinnati Museum Center, or to mediate use, as at the Naturalist Center at the North Carolina Museum of Natural Science and the Quirius collection at the National Museum of Natural History.

The National Museum of Natural History and the Denver Museum of Nature and Science also identified reasons behind their methods of storage. For the Denver Museum of Nature and Science, storage is used to mitigate other sources of damage to the object that are not handling. “My biggest risk to them is as you may imagine physical damage, because we're inviting people to touch. Where we try to mitigate that as far as we can is in their storage,” said one interviewee, later adding that, “at the end of the day this is [storage] material that's holding stuff that's primarily getting damaged because of people handling it.” A study participant at the National Museum of Natural History expressed a similar idea, stating: “We also insure that the housing

we're using also provides some kind of protective care to the object, because they're being handled and used by thousands of people in a given year." She also acknowledged that housing was just a preventative measure and that the majority of damage to these objects would come from use, saying, "These are education collections and they're not meant to be treated in exactly the same way one would treat permanent collections, but we do try to make them housed in a way that they'll be available twenty years down the road or longer, if we're lucky." For both of these museums storage materials and methods are regarded as necessary to care of the collections, while both also acknowledge that these collections are not going to be damaged for the most part by inherent vice or off-gassing in storage, but by handling.

**c) Legal and Stewardship.** At each of the case study institutions, participants made mentions of legal and stewardship issues associated with caring for education collections. Most of the concerns expressed related to species regulated under federal law or international acts. Three of the case study museums discussed the impact of federal regulations on the acquisition decision. Since some species are regulated by federal law, like marine mammals, and others by international acts, like CITES (the Convention on International Trade in Endangered Species), holding these specimens in an education collection, where they are expected to be used, often requires a higher standard of care than may be typical of the education collection. While the Cincinnati Museum Center is in general moving towards an unaccessioned education collection, one participant expressed the belief that endangered species and other regulated specimens would continue to be accessioned for legal purposes. She said:

Some of the pieces we just actually we have to legally [accession]...either they're eagles that are federally, technically federally owned, or they're collected from federal land, or another private entity, government entity, that requires us to maintain ownership, so for tracking purposes we accession.

A participant at the Denver Museum of Nature and Science expressed a similar sentiment

regarding the museum's legal responsibility. The education collection at DMNS is largely accessioned except for replicas, casts, and other easily and inexpensively obtained items. All authentic objects and real specimens are accessioned and especial attention is paid to specimens of endangered species or species regulated by permits. According to the participant, "things like our bald eagles, our rhinoceros horns, our elephants, elephant tusks and elephant parts, things that are hunted for permits or collected under permits...that stuff gets accessioned so we can trace legal ownership and taking of the animals and the legal history of them."

While for the Denver Museum of Nature and Science discussion of regulated species linked in part to reasoning for the accessioning decision, at the North Carolina Museum of Natural Sciences, it was brought up in discussion of what specimens to accept into the collection and which to keep. One interviewee emphasized that NCMNS would not accept or keep regulated species without the proper documentation. He said, "If we have the specimen that are regulated that lack documentation and we'll take them out of our collection and we won't take anything without the right paperwork."

At the Natural Museum of Natural History the issue of regulated and endangered species did not connect to a discussion of acquisition; rather, care for regulated species came up in the context of handling specimens in the Q?rius exhibit. Specimens were afforded a higher level of protection from handling by virtue of being a regulated species. A participant stated, "If it was considered a listed specimen, either on the Endangered Species list or CITES or on the Migratory Bird Treaty Act, then that automatically got a higher ranking as in you couldn't, the visitor couldn't, take it out of the box directly."

**d) Preservation.** At all of the case study institutions, study participants discussed conservation practices in response to questions about general collections care and repair

practices. Two institutions, the Cincinnati Museum Center and the Teaching Collection at the North Carolina Museum of Natural Sciences, both have more informal approaches to repair, in that it is done on an ad hoc when the need for repairs has reached a critical mass or by those who do not necessarily have conservation training. The other two institutions, the Denver Museum of Nature and Science and the National Museum of Natural History, have more formal practices regarding repair, including providing training to repair objects. At none of these institutions does it seem to be common practice for a conservator to repair education collection objects. One participant at the Cincinnati Museum Center stated that if “a historic artifact that is slightly damaged and it can be repaired, absolutely, we’d glue something back together,” and later acknowledged that the museum cannot finance conservation level treatment for the education collections. The Teaching Collection at NCMNS, has an “informal policy about how we do the care, when something is damaged it gets pulled from the collection and then we get enough specimens, or if something really important gets damaged, we’ll go and figure out how to repair it.” These repairs are done “with the help of research curators and exhibit staff,” which suggests a greater level of formality and possibly training to the repairs done in the Teaching Collection. The training involved in repairing objects at the Denver Museum of Nature and Science and the National Museum of Natural History suggests a greater level of formality in repair practices; however, at these two institutions, the repairs are not done by conservators, but by other trained individuals, often volunteers or interns. At the Denver Museum of Nature and Science, volunteers are trained in repair techniques. According to one participant, “a lot of the training of the volunteers, the behind the scenes volunteers of the education collection is in proper techniques in how to repair and then get it back out onto the floor.” For the National Museum of Natural History, repair of education collections objects also serves as training for conservation

interns. According to one participant, “We have a conservator on at our museum and she has interns, and when collections need to be repaired that are from the education side...her interns will work on those collections, so in a sense it’s a training effort for our conservator’s interns.”

While all of the museums talked about preventative care and general preservation of specimens in their education collections, two museums linked this care directly to programmatic usefulness and extending the programmatic lifetime of these objects and specimens. At the Cincinnati Museum Center, when specimens are damaged, the decision to repair is based in both financial considerations and usefulness. The museum values the education collection but cannot necessarily afford high levels of treatment on damaged education collections objects. As one participant said:

We’ve determined that we just financially don’t have the money to do conservation level treatment on education collection materials. That doesn’t mean though that we might not do some preventative maintenance or those kinds of things on them if it would extend the lifetime of its programmatic use.

A participant from the Denver Museum of Nature and Science also made a statement regarding maintaining the usefulness of education collections objects, stating that keeping them available and in shape for educational use was the purpose of repair, not to maintain their integrity as specimens for scientific study. “We repair what we can,” he said, adding later, “Sometimes we have to get a little bit creative with how we repair things because again we’re repairing things with an eye toward not necessarily preserving their integrity scientifically, but repairing them while preserving their integrity for educational use.”

The Denver Museum of Nature and Science and the National Museum of Natural History both mentioned how they would address a situation where a previously broken object that had been repaired continued to break. One interviewee from NMNH stated, “We’ve had things that we repaired or the conservators have repaired...and we found that they’ve broken again, so our

new plan is in many of those instances...if it can be done [we] just rehouse the object in another way that would protect it [or] we may move it in from Q?rius.” At the Denver Museum of Nature and Science rehousing damaged specimens is also used as a way to make these objects last longer. One interviewee gave an example:

If something was getting damaged more, we might change it from go ahead and pick it up to single finger touch only and that way we could rehouse a specimen from being in an open box into a partially closed box, maybe with access for only one finger, or provide some tie downs so that it couldn't be picked up out of the box.

**e) Managing Use.** To manage the use of these hands-on collections and to promote their longevity, all of the case study institutions manage the use of the education collections by conducting training in one form or another. Depending on the museum, this training is aimed either at educators who will be using or borrowing the collection or at visitors who will be using the collection in a publicly accessible space. The Cincinnati Museum Center, the Denver Museum of Nature and Science, and the National Museum of Natural History all referred to training for those who borrow the collection to use inside or outside the museum, and all mentioned the handling guidelines for the collection, though these differ in structure.

The Cincinnati Museum Center conducts informal training on an individual basis. One participant stated that, “We don’t do any formal training, but it’s a sort of a informal kind of a process the first time someone comes and they want to borrow stuff, we just sort of talk them through maintaining it and respecting it and just handling and returning it the same shape that they got it.”

At the Denver Museum of Nature and Science training to use the education collection is a more formal process. Like the Cincinnati Museum Center, though, this training is aimed at the educators who will use or the teachers who will borrow from the education collection. One

participant stated:

When the objects are loaned out to institutions and to schools there are policies that are written to protect the objects and the people who borrow the objects are required to come in to the museum and have a face to face training before they can go out to the schools...[and] that every single person who's going to touch or use the objects is trained in how to take care of them and how to help the students who are going to interact with the objects.

This training is about “minimize[ing] any damage to the objects.” In addition to this training for people outside the museum who borrow from the collection, there is training for the educators at the museum. The education professional participant from DMNS stated, “Educators are expected to understand the fragility of certain objects as well as each object has individual needs to keep it safe and keep it well-protected, so when we check those objects off we're told what those are and the expectation is that we'll follow those.” To facilitate handling of these objects, an education collections manager developed a stop-light inspired touch-code. One interviewee summarized this system:

We have a touch-code system that is more or less the stop-light system, so green is please touch and handle responsibly, yellow is use a couple fingers to touch, usually moving in the direction of feather or furs in the case of animals, and red is do not touch. We've also added another level to that which is a blue touch which is a don't open this file or open this box because whatever's inside it is fragile and we don't want it broken.

At the National Museum of Natural History there is training not only for educators, other staff, and volunteers, but also training for the visitors who enter the Q?rius collection. For Q?rius volunteers and staff, “there is a substantial training program that goes on” which originated with the Q?rius collection in order to teach the volunteers. According to one participant, “they [the volunteers] had to understand what the collections were all about and they had to understand why Q?rius existed.” Staff and trained volunteers staff the Q?rius collections area to monitor behavior and train visitors: “The public actually, they're trained when they come into the

collection on how to handle the collection, there's a docent and all, or a volunteer that is, greets the visitor and goes through the color codes." The collections area in Q?rius is always staffed. When visitors enter the space, volunteers educate visitors on the color code system, which follows the stop-light system: green, yellow, and red. This touch code system only applies to objects within Q?rius, though the principles of the system are used for other education collections objects. A green code indicates "anybody can handle it." The yellow codes are "objects that can be handled with supervision. Not toxic, they're not sharp, they're not too small, but they do have some fragility to them." The red codes are those objects which can be looked at but not touched, such as items "treated with chemicals that we don't consider safe for people to handle." A schema was developed to aid in classifying the objects for Q?rius. According to one interviewee:

We had the three ranking areas, one was safety, two was preservation, and three was legal documentation. And then we asked the four questions: Can the object be handled or displayed without restriction? Can the object be handled if assistance from a volunteer is required? Can the object be restricted to handling only with safety controls such as through an enclosure? Or does the object need to be returned to the collections?

The color codes influence how the objects are stored within the exhibit, which impacts how visitors can handle the objects. "We have green for you can open the box and handle the object, and we have yellow, which you need to handle it with a volunteer present, and red, it can't be taken out, you can look at it from the box but it can't be taken out." One study participant at NMNH expressed a belief that this in-exhibit training impacts how visitors interact with the collections in Q?rius, saying, "Visitors for the most part quickly learn that this is a place to be respected...just by [us] saying, hey, this is a representation of our research collections, so handle them not like a football, but as a scientist would."

Similar to the training in Q?rius aimed at visitors, the training mentioned by participants

from the Naturalist Center at the North Carolina Museum of Natural Sciences was also aimed at the public who would be handling the collection. According to one of the Naturalist Center representatives, “Visitors come into the room and get a brief orientation, they watch a four-minute video. It gives them a very superficial as far as where the specimens come from, how to handle them, and the look of the room.” In addition to this video training, there are always staff and volunteers present in the room to monitor use. Within the Teaching Collection, educators who borrow objects are alerted to the requirements of individual objects when they borrow them. As one Teaching Center interviewee stated, “We do have guidelines as to how specimens are to be used by staff and including which ones are handle-able, which ones are for your eyes only.”

As museums manage the use and care of these hands-on collections, they consider also the safety of both visitors and objects. Three institutions addressed how they consider specimens and objects that have been treated with hazardous materials, since poisonous substances like arsenic were once commonly used to treat specimens for pest infestations. At the Cincinnati Museum Center, objects and specimens which test positive for hazardous materials, like arsenic, are not incorporated into the education collection. As one interviewee said, “Only things that are deemed safe are given over to that collection, so if anything has any potential hazard material always stays in the curatorial side of things.” The consideration of safety also extended to other handling concerns, like sharpness. When evaluating objects to include in the education collection, the staff at the Cincinnati Museum Center, “identified materials that could be handled both safely by the general public and sort of safely in the context of the education collection and then we determined if you know for whatever reason they got used up or destroyed that that was okay as well.” The Denver Museum of Nature and Science, due to their handling codes, does allow items treated with potentially hazardous materials. When items “come into the collection,

we tag them, make an assessment based on their fragility, whether or not they have arsenic or mercury on them, whether or not they're sharp, what their danger is to other people and what their risks are as collections as far as break-ability.” This assessment informs what sort of color-code the item will receive. Items that do test positive for hazardous materials or otherwise pose a threat to visitors if handled directly are given a red code to prevent them from being touched.

The National Museum of Natural History conducted a similar assessment on items for the Q?rius exhibit to determine how items should be handled and which items could be incorporated into Q?rius based on handling requirements. One interviewee discussed the reasoning behind this assessment: “We [collections and education] had to work cooperatively to figure out the best way that things could be handled to keep not only the objects safe perhaps but the people safe as well.” Regarding the presence of hazardous chemicals on collections, this same participant stated, “If things have been treated with arsenic or with mercury chloride, they couldn't be directly handled by the public, ever. We have a zero tolerance policy for that kind of exposure or potential risk to our visitor.” For these museums the care of the education collections objects is connected to the safety of the visitor, who will be handling the collections.

**f) The acquisition decision.** Participants at each case study institution expressed the expectation that being part of the education collection would “use up” these objects, eventually causing them to be damaged beyond usefulness. For some institutions, this expectation was couched in language that explained their accessioning choice (either to accession or not to accession). The Cincinnati Museum Center is one such institution. At this institution, the education collections are not accessioned, unless they were accessioned historically. As one interviewee explained, “Moving forward, we don't want to add items to the collection that potentially can be damaged, destroyed, or used up, and then have to go through the process of

deaccessioning them.” A participant from the National Museum of Natural History expressed a similar sentiment that the impermanent nature of the education collection is part of the museum's decision not to accession the education collection. She said:

By virtue of it being an education collection it's not there for permanent purposes, it is meant to be used and consumed and handled by the general public, so it's not meant to be around for hundreds of years, like our permanent collections we hope will be....Hopefully we have legal title to everything but it's not accessioned as in it's not meant to be a permanent of the institution which is forever.

In contrast, the Denver Museum of Nature and Science chooses to accession objects even though there is the expectation that these objects will be damaged. According to one participant:

While we have things that would not necessarily be accessioned into the research collections for instance, birds without data or replicas...that are great for hands-on, it is a formal collection of the museum and accessioning helps us abide by the policies of the museum...We want to say, yes the museum owns these, even though we know that they may get consumed in the course of their life here at the museum.

At the North Carolina Museum of Natural Sciences, participants' expressions of the expectation for loss were not tied into the accessioning decision. For the Teaching Collection at NCMNS, the objects are meant to be used a lot, and they acknowledge that will lead to damage and eventual replacement. As one participant stated:

There's a little bit of an expectation that in the Teaching Collection these items will eventually get damaged and need to be replaced. We do have objects that are very old and who have managed to make it all these years, so, but again, the Teaching Collection is an area where things are expected to be used a lot.

**Research Question 2: How do these museums decide what to incorporate into and what to remove from the education collection?**

To address this research question, study participants were queried regarding how their institutions select objects for the education collection and what types of considerations go into removing items from the collection. As it emerged in this question, the institutions weigh the

benefits of having and using an education collection with the needs for preventative maintenance and repair to objects to extend their useful lives. Six themes emerged from coding: a) usability; b) curatorial oversight; c) capacity; d) inter-collection cooperation; e) disposal and exclusion criteria; and f) aesthetics.

**a) Usability.** When asked about what objects they incorporate into the education collection, participants often referred to the programmatic use of collections as a factor which determined whether they would be accepted into the education collection and whether the objects would remain in the education collection long term. The Cincinnati Museum Center acknowledges that education collections items may only have an educational use, not a scientific one. One participant said, “If there isn't a scientific reason for us to accession them into the collection, but we know that we can use them for programming, that would be something we would accept currently into the education collection.” The participant at the Denver Museum of Nature and Science mentioned how usability is the most important factor for accessioning into the education collection. He said, “I use the programming needs as the primary determinant factor.” At DMNS, a recent Institute of Museum and Library Services grant allowed the museum to run a synthesis project on their collection. When evaluating the education collection, the participant said, “We looked at the direction that our education department is going in at the museum, we looked at the programs and we looked at our long term collections and research plan and were like, okay, so what things match with this and what things don't match with this.” For both of the hands-on collections at the North Carolina Museum of Natural Sciences, usability is a consideration. As an interviewee representing the Teaching Collection said:

When we consider whether to take an object, we'll look at a variety of different things, [such as] whether it's usable in a program...We consult with other education staff to decide if there's a need worthy of taking on something new. Some decisions are pretty easy because we know what people use, but other

decisions we shoot out to a broader audience to see if anyone wants a specimen enough for us to take it in.

A representative of the Naturalist Center at NCMNS agreed with the participant who works with the Teaching Collection, and elaborated, saying, “We look at do we already have it, if we don't, is it appropriate for the collection.” The National Museum of Natural History also considers whether the object would be a useful addition to the collection. Two participants stated this idea in different ways. One said, “If new things are added now it's usually because an educator has something that they'd like to add for its use for a planned activity or program.” The other elaborated, stating that, in addition to considerations of handle-ability, “the other guideline is how we would use it...as part of an experience for visitors to learn something new about the cultural and natural world.”

Several of these institutions, like the North Carolina Museum of Natural Sciences and the National Museum of Natural History, explicitly mentioned consulting with educators, or otherwise mentioned the importance of educator input. A participant at the Denver Museum of Nature and Science summarized this practice, saying “The wish-list often will come from the programmers, the yes for that, the okay for that will be the curators.”

**b) Curatorial oversight.** Participants from these institutions also talked about curatorial oversight in the acquisition and disposal processes. Three of the four institutions have some sort of curatorial oversight of the acquisitions for the education collection. At the Cincinnati Museum Center, the curators for the departments recommend items for the education collection and a committee approves the decision. According to one participant, “It is a curator-initiated position. And it is essentially approved by a staff level committee that it will go into the education collection.” The other participant elaborated, stating that, “The decisions are made with [the registrar] and the curators and the person who's currently managing the education collection.”

The decision at the Denver Museum of Nature and Science is also curator-initiated. Said one participant, “It's really curators choice as to what goes into the education collections.” At the North Carolina Museum of Natural Sciences, the Naturalist Center gives the research collections the first right of refusal on anything brought in. One participant said, “Everything we bring in goes first through our research curators...If they do not think it's something they need or want, they will give it to us. And the same goes for things that are brought to them.” Since the education collection at the National Museum of Natural History is operated by the Office of Education and Outreach and not by the research collections department, the decisions for that collection are made by committee, not by a curator. According to one participant,

There's a committee that makes determinations as to whether or not we should accession something into the education collection...The committee changes over time, so it would, it includes staff in the Office of Education and Outreach, and someone who's involved in the collections management, someone who is involved in the visitor experiences, as well as upper level management in education and the director of education as well.

While the education collection at NMNH might not have direct curatorial oversight in the acquisition process, the Office of Education and Outreach has sought the support of curators and the research departments before, such as while developing the Q?rius exhibit.

**c) Capacity.** When considering whether items should be added to the education collection, all of the participant museums mentioned, in one way or another, assessing their capacity to store and care for more specimens. Even for education collections, these museums thoughtfully consider their resources and assess whether they have the capacity to accept more objects for the collection. At the Denver Museum of Nature and Science, in addition to the usability of the items, space to store them appropriately is another important factor. As one participant said, “I don't have infinite space and I don't really have a lot of room to grow, so I kind of have to watch what comes in.” Both collections at the North Carolina Museum of Natural

Sciences expressed the need to have enough space before accepting new acquisitions. A Teaching Collection representative stated, “When we consider whether to take an object, we'll look at a variety of different things...[such as] do we have storage available to take another specimen in, which we're offered some collections that we just couldn't, we just couldn't fit them in.” One of the interviewees who works with the Naturalist Center collection at NCMNS made a similar statement:

If it's something that we think is worthy of putting in the collection but we don't currently have space for it, we have to determine if we have space to store it. Storage is a real rarity at the museum, so a lot of times if we get a collection donated, we, if it could be a really nice collection but we don't have room to store, we have to turn it away.

Both the North Carolina Museum of Natural Sciences and the National Museum of Natural History also made statements regarding considering other resources, in addition to space. The North Carolina Museum of Natural Sciences, in addition to considering space, assesses the budget for care. As one participant said, “When we take something in we think about what the cost of maintaining it.” The National Museum of Natural History also considers the budgetary requirements of housing and maintenance. As one participant stated, “We might test a few things, test different kinds of housing to see how it lasts, how long something lasts and then decide after that point whether or not the cost of housing it and repairing it means that we—it's worth the time to constantly have to keep that.”

**d) Inter-collection cooperation.** Interactions between different collections at the participant institutions often pertained to transfers of objects or specimens between collections. These transfers work both ways, with research curators offering objects that either they acquire and do not need or that they deaccession. Education collections at these museums may also offer a specimen back to the research collections after it has outlived its educational usefulness, in the

event that it retains some scientific use. At the Denver Museum of Nature and Science, deaccessions from the research collections are offered to the education collection first, before they are offered to other institutions or disposed of completely. The “education collections got first right of refusal on deaccessions from our research collections,” said a participant. The transfer of objects between collections is not one-way at the Denver Museum of Nature and Science. Sometimes, if a specimen still has scientific use after it has outlived its educational one, it will be transferred to the research collection:

Sometimes it goes back to our research collections where it's important to keep say a bald eagle because it's a bald eagle, but it will go back there because they care less about what it looks like as opposed to actually having the skeleton to study or the feathers to study, or being able to get DNA out of the animal.

At the North Carolina Museum of Natural Sciences, the three collections (research collections, Naturalist Center collection, and Teaching Collection) all cooperate so that specimens and objects end up where they will be of best use. The standard is that acquisitions are offered to the research departments first, then to the Naturalist Center, and then to the Teaching Collection. As one interviewee stated:

If a specimen is brought to them [the research collections] they don't want, they'll come to us and say, 'Do you want it?' If we say we already have it, it will go to the Teaching Collection and say, 'Do you use that, want it?' And so we kind of pass things around until the item finds a home.

In the National Museum of Natural History, the Office of Education and Outreach worked with the research departments on Q?rius, getting input from the research curators and staff regarding how well-suited items were to Q?rius. One interviewee said, “The departments...could review the collections and they worked with the educators to say, this is really good for the public to be able to see this versus this is probably not, it doesn't have a good story to tell, so you may not want to use this right now.” In the event that the research curators identify specimens that should not be

in the education collection for reasons of scientific value or rarity, the research curators can ask for those back. When reviewing objects for Q?rius:

If they [the research departments] saw specimens that were unique or valuable to research, departments have the first right of refusal, so collections that are part of the education collection or specimens and objects part of the education collection could be returned to the department if its research value in particular was found that it was too important to be in the education collection.

Another interviewee at NMNH stated that, “Our current thing we would do if we ever considered a disposal, would be to offer it back, offer the departments the object first or the specimen to see if they can find a value in them.”

**e) Disposal and exclusion criteria.** When discussing reasons they would remove objects from the collection or would not accept them in first place, participants most commonly cited breakage or damage. At the Denver Museum of Nature and Science, a participant addressed how damage, especially repeated damage, can lead to the decision to remove an item from the collection. He said:

We have some things, we have several ocarinas from Central America that have been broken twelve to twenty times and we repair them, but at some point you can only repair them so much before they start looking not nice. So at that point you'll make a recommendation for deaccession.

A large part of what matters once an object has been damaged is whether or not it is still useful for education. The same interviewee framed this concern this way: “How good does it look to how are its teaching points still in tact with the aesthetics bent, can we still teach with it and look like we know what we're doing and look like a professional organization with it?” The North Carolina Museum of Natural Sciences discussed how damage to specimens affects the decision to replace objects. One participant stated, “Obviously damage and wear and tear is an issue in a hands on collection...[A specimen] might lose all its fur and feathers and become bald and then we'd want to get a replacement specimen for that.” Damage from handling is also a concern at

the National Museum of Natural History and would be a reason to remove an item, especially from the Q?rius collection. For the Q?rius collection an object or specimen, “may be removed because maybe it just falls apart too much because of public handling.” Further, a participant from NMNH suggested that objects “broken beyond repair, or broken to the point that the money are not available to do restoration or repair” would be removed from the education collection.

Beyond the reasons of breakage, all of the participant museums made statements regarding the programmatic usefulness of the objects as a consideration for accepting them, suggesting that when an item outlives its programmatic usefulness it would be removed from the collection. Other reasons for removing items from the collection or excluding them include culturally insensitive materials or materials with high monetary values. A participant from the Denver Museum of Nature and Science also suggested that those items which were insensitive may be removed from the collection, saying, “There was some stuff that we had that was just culturally insensitive stuff, like stereotypical dolls of Native Americans that had been brought in over the years...So on the cultural side, if it's culturally inappropriate or culturally stereotypical.” At the National Museum of Natural History, the monetary value of specimens may be considered. According to one participant:

There's certain things that obviously the research collection can have that we can't, previous gems are one thing that we're not going to have in the education collection...So there are some things that make sense either for a value perspective or a safety perspective that we cannot have in our education collections.

**f) Aesthetics.** In addition to all of these other considerations, the National Museum of Natural History and the Denver Museum of Nature and Science made statements regarding the aesthetic appeal of the collection. A participant from the National Museum of Natural History framed the aesthetic appeal as something that could be lost after too much damage. She said:

If you have something like take a rock for example, and bring the rock out but the

rock keeps breaking, after a certain point the fact that we had to glue it back together several times makes the rock unattractive. We don't want to bring unattractive things out, because part of what the collection does is awe people. So, it's not awesome if it's full of glue.

A participant from the Denver Museum of Nature and Science related the aesthetics of the collection to the professional appearance of the museum:

Largely there is a much more aesthetic appeal to our collection than there is to the research collection, where we don't put stuff out if it doesn't look good because it is going on display it's being used, it is in classes, the public is seeing it and if it looks like crap we look unprofessional, so there is an element to how nice does it look.

### **Research Question 3: What are the institutional benefits and limitations associated with maintaining an education collection?**

The third research question addressed what the benefits and challenges are for these museums that have chosen to maintain education collections. Interviewees responded to direct questions about the benefits and challenges they face with these collections, as well as the ways in which programs use the education collections. In general, benefits articulated by participants in this study fell into three categories: a) programmatic, b) experiential, and c) mission-based. The challenges faced involve how to balance handling with preservation, as well as other challenges which are shared across the institutions and within the institutions in their various collections, challenges like space, staff, and funding.

**a) Programs and engagement.** When discussing the programmatic benefits of maintaining an education collection, these institutions most often recalled the way that education collections can support education, the variety of programs that use education collections, and the benefits for science learning.

Participants at three institutions talked about how the education collections are meant to bolster programming and educational efforts at the museum. These statements tended to be

straightforward. At the Cincinnati Museum Center, one interviewee stated: “It is really to support our educational programs.” A participant at the Denver Museum of Nature and Science made a similar statement: “It’s there to serve as an outreach support for all of our programs.” A representative of the Teaching Collection at the North Carolina Museum of Natural Sciences said, “The purpose of the education teaching collection is to support hands-on science programs.”

The range of programming in which these museums use their education collections is broad, stretching from enhancing educational programs to supporting development activities. The Cincinnati Museum Center uses the education collections for exhibit, for loans, and in “a variety of educational programming...from historic demonstration to nanotechnology.” The greatest use of the education collection is in floor demonstrations: “The majority I would say 90% of the education...collections get used in floor demonstrations.” The education collection at the Denver Museum of Nature and Science is used in “almost all programs...and that includes in house permanent exhibits, in house traveling exhibits, the formal education programs for schools and for teachers, training, tours, children's workshops” and more, including loan programs and outreach. One interviewee from DMNS conjectured that “Pretty much...every department makes use of them at some point,” and estimated that the education collection supports about 4000 programs per year. The two collections at the North Carolina Museum of Natural Sciences have different programmatic uses. The Teaching Collection operates much like the education collections at CMC and DMNS, serving a variety of programs, including: “special events for the general public...classes and workshops for the public, educator, both formal and informal, educator training.” The Naturalist Center, as a public space in the museum, works mostly with visitors, though educational programs and other activities are invited to use the collection as

well. As one interviewee said: “Our primary user is the visitor to the museum, and then we also work with school field trips so schools that come to visit the museum come into the room.” She also mentioned a variety of other opportunities that the Naturalist Center has taken advantage of, stating: “We also have worked with local universities...[and] we've worked with artists who want to come in and use the specimens for painting projects creating all different kinds of artwork.” This participant also optimistically observed: “Our reach is pretty broad, and I'm sure there are ways that the collection will be used that we don't even know of right now.”

The Cincinnati Museum Center and the Denver Museum of Nature and Science explicitly mentioned how they extend their reach and try to make the collection as useful and as used as possible. An interviewee from the Cincinnati Museum Center stated, “I'm trying to think if we've ever turned down a request from the education program...I think we're pretty receptive to just about any request from the education program.” With the education collection so accommodating to requests, another participant from CMC stated, “I think the majority of our floor programming they go out of their way to do a lot of hands-on artifact and specimen based programming. So I think it's just a sort of a natural part of what we do here.” At the Denver Museum of Nature and Science, the educator interviewed mentioned that “We almost always try to think about...how you can capitalize on that collection in almost all of the education efforts we do.” Beyond supporting educational programs, at the Denver Museum of Nature and Science, the education collection really offers support to any and all departments who seek it. As one participant said, “We [the education collection] have over the last what is now 25 years really established a reputation that we can help departments augment pretty much anything they do.”

Three of the case study institutions also mentioned how using the education collections serves to aid science learning. One participant at the Denver Museum of Nature and Science

expressed his belief that using the education collections engages visitors with science. He believes that:

[One] goal in using these objects is to use the objects to connect students with the process of science as well as with scientists themselves so that we develop the next generation of science-thinkers, and to do that we have to be able to have them both feel a connection to scientists and objects in the education collection are one way to get at that.

Both collections at the North Carolina Museum of Nature and Science have goal or mission statements regarding their collections, and both of these statements relate to science learning and engagement. The Teaching Collection's goal is: "to develop and provide engaging and inspirational natural science resources programs, and experiences for the people of North Carolina and beyond in order to enhance understanding and appreciation of science and the natural world and our relationship to it." The Naturalist Center's mission is:

To provide the citizens of North Carolina access to a comprehensive natural history reference collection emphasizing the flora, fauna, and geology of the state of North Carolina and the southeastern United States. To demonstrate to the citizens of the state of North Carolina the value of research collections and how they are used in scientific research.

Both of these goals relate the purpose of the collection to science; the Naturalist Center's goal also emphasizes the connection with collections and scientists, like the interviewee at the Denver Museum of Nature and Science did. Interviewees at the National Museum of Natural History also emphasized the role the collection plays with regards to science and understanding what scientists do. One interviewee stated that: "In the broad sense the purpose is to offer our audiences the opportunity to use collections to understand something new about the cultural and natural world much as our scientists do." The same interviewee later elaborated on this point, saying: "The collections are evidence of the things we talk about, and direct evidence of the science that we're trying to communicate in the museum."

**b) The real thing and experience.** When discussing the benefits of having an education collection, participants at every museum mentioned, in one way or another, the importance of real objects and the unique experience that comes with being able to interact hands-on with these objects and specimens.

The Cincinnati Museum Center emphasized the power of these authentic objects for learning. One participant stated that the goal of the museum for education collections is “to provide learners, whether they're adults or children, with opportunities to see and experience real things, whether it's artifacts or specimens.” She emphasized “how important it is to have that real piece of history.” At the Denver Museum of Nature and Science there is also a belief in the power of the authentic object. Said one interviewee: “The fact that I can hand you a sixty-five million year old dinosaur bone is irreplaceable. And it is that experience with the authentic object that is really powerful for teaching purposes and is really memorable for teaching purposes.” The same interviewee later stated, “It's a much more relevant experience when you have the real thing as opposed to just reading about it or seeing it behind glass. So that's kind of the pedagogy behind why we put things in people's hands.” The North Carolina Museum of Natural History made mention of the importance of the real thing as well, connecting it to the fact that in the modern era humans are much more connected to technology than nature. As an interviewee from the Teaching Collection discussed the “experience of being able to see things up close...a specimen or the real thing” and expressed:

I think that's particularly important right now since people are glued to their screens and have and by just by our urbanization have less contact with wildlife... [but the museum] can really kick it up a notch for people, really bring it home in a way that even something...on a screen is not going to do.

At the National Museum of Natural History this contact with the authentic object is also important. According to one interviewee “The number one reason they [visitors] come to the

museum is to see the real thing, and, with educational collections, they can actually hold something and examine it up close as well.”

There is much to the experiences that education collections provide. At the National Museum of Natural History, it is a lot about connecting with objects and collections. As one interviewee said, “Collections are at the center, the heart of the museum. By bringing them out the visitors get a unique experience they couldn't get anywhere else. They can see, they can touch, explore and examine things they might have only seen in photographs or on TV.” For the Naturalist Center at the North Carolina Museum of Natural Sciences, the connection education collections offer is also about nature. One participant said:

The visitor can come to the museum and really experience a collection in a way that is not common, to be able to handle specimens that are things that you usually see behind a glass case. It gives people an experience that is really memorable and I think connects them to nature in a way that is pretty unique.

The Denver Museum of Nature and Science emphasized that interacting with the real thing benefits people with different learning styles. One participant stated:

If you can actually interact closely and look at something from three dimensions, the real thing, if you can touch the real thing, that adds to the experience on one hand. It also adds to those folks who may not just be visual or auditory learners, but also tactile learners. So it adds to the experience of the museum by having these actual things.

Another participant from DMNS also discussed how the education collection serves to make abstract scientific concepts more concrete. He said:

The physicality of the objects themselves provide a connection to things that are somewhat abstract sometimes to young people and gives them a way to, since they interact with objects every day in their every day lives, it gives them an entry point to the process of science by having access to things that are used by science and come from nature.

At the Cincinnati Museum Center, just as at the National Museum of Natural History, study participants believe that the desire to engage with authentic objects is what draws visitors to the

museum. One participant stated that:

Many people are clamoring for the ability to touch things to experience them, and so having a collection of materials that can be handled one, protects the accessioned collections from that handling and, two, allows people go get that more authentic experience that I think many people are looking for when they come to the museum.

This same participant from CMC echoed what a participant from the Denver Museum of Nature and Science said regarding how the education collections reify abstract concepts. She said, “It takes a lot of these abstract ideas and turns them into something that's accessible and real for an average visitor. I think it really enhances the quality of the programming.”

**c) Mission and alignment.** Participants from two of the institutions connected the work done with the education collections to the larger behind-the-scenes work done in the research collections. An interviewee at the National Museum of Natural History made a statement regarding the education collections and the help that these hands-on collections can be in furthering the collecting and research goals of the institution. She said, “It helps the public understand why we have collections, why it's important to understand how to not only identify a new specimen or an animal or a plant, but why it's important to understand whether it's a new species or is it the same kind...that's been around forever.” At the Denver Museum of Nature and Science, one participant talked about the visibility of the education collection as an aide-mémoire for museum staff regarding why the museum exists. As he said:

The education collection is a lot more visible than our research collection and so it's a reminder to the staff that may not work in collections and research that, hey, we have objects in this museum, and it's kind of one of the reasons we have a museum, the main reason we have a museum.

Another participant at the Denver Museum of Nature and Science linked the education collection to the research collections more as a way to show the public what else the museum does. He stated:

The education collection lets them [the larger community of the museum] get a glimpse into the larger permanent collections that are being kept here at the museum and preserved and studied by science on their behalf. It allows them, the larger community, to kind of get a taste of what the scientist and the research scientist at the museum are doing, by letting them engage in the processes of science when they visit the museum and interact with the education collection objects.

A participant from the Denver Museum of Nature and Science also made an explicit statement regarding the relation of the education collections to the mission of the museum. When discussing the purpose of the education collections, he said, “It furthers our mission, which is the museum's mission, which is to be a catalyst for science in the community, to bridge the gap between science and the local community, to spark an interest in understanding science and also preserving objects that are of value to our community.”

**d) Challenges.** When asked about the challenges that face the education collections, most participants mentioned at least one of three things, which they also identified as challenges that face museum collections in general: staff, space, and funding. Adequate staffing levels were indicated as a challenge at all four institutions; both funding and space were indicated as challenges at three of the four institutions.

In addition to these shared challenges, these institutions also face the challenge of managing a consumable collection and determining their approach to preservation and use. For the Cincinnati Museum Center, this challenge isn't internal to the education collection, but rather external, attempting to maintain care standards for the research collection while still providing the best educational programming possible. As one interviewee stated:

We're trying to balance both the educational programming needs of the organization with the long term care of collections that don't fall into that category. Cause it's...our responsibility for the public good versus creating meaningful experiences within the museum and...it's a hard thing to balance.

A participant representing the Naturalist Center at the North Carolina Museum of Nature and

Science also expressed their concern for maintaining standards of care while dealing with damage from handling. He stated: “The other main challenge for us is just dealing with wear and tear and keeping standards as well...Carefully managing specimens so that they don't become damaged is one of the big issues that we face.” The challenge of managing use so that specimens don't need to be disposed of was echoed by a participant from the National Museum of Natural History, who said: “I think the biggest challenge is that so many people handle it [the education collection] and how to keep it in a good condition so that you don't have to take it off our of the collection and dispose of it in the trash.” Another participant of from NMNH framed this discussion within the museum's responsibility to provide access. She said: “It is our responsibility to care for them but at the same time it's our responsibility to make them accessible and that's a challenge to see where that line is. And to constantly be rethinking where that line is between stewardship and access.”

Though these museums share many challenges when it comes to education collections, there are also unique challenges that they face. At the National Museum of Natural History, one participant discussed how the museum will face the challenge of messaging well. She said:

I think the next challenge is we're sending good messages out to the public about why we have our collections. I mean not good as good in the sense of good and bad, but well-thought-out and well-articulated like these are the reasons or this is the reason why we have the collection.

At the North Carolina Museum of Natural Sciences, the Teaching Collection is facing the challenge of focusing the collection, a challenge which has been somewhat ameliorated by the existence of another hands-on collection at the museum, the Naturalist Center. As one participant said:

The challenges we're still dealing with are organizing and focusing the collection...As the museum has changed our collection has gotten more focused...For a long time we kept stuff because you don't want to throw out

perfectly good specimens, but once we got the Naturalist Center, that gave us a place to send all our study skins because...that met their mission better than it met ours.

At the Denver Museum of Nature and Science the persisting challenge is one of institutional organization. One participant discussed how the education collection doesn't fit completely in museum programming or collections and research but is part of both. As he said:

The greatest challenge is...largely they've never really known what to do with us. Cause we're not really...a museum programs department, we're not educators, we are collections managers, we are scientists...but we're not really research collections...We're really at the convergence of science and research and public communication of science.

These unique challenges show that, while these institutions do face similar struggles with regards to their education collections, not all problems are shared problems.

## Chapter 5: Conclusions and Recommendations/Implications

### Conclusions

This research study attempted to describe the standards of care for education collections at natural history museums, as manifested in both formal and informal policies and practices, as those care standards relate to the use of the collections. The researcher employed a case study design in order to answer overarching research questions.

Four key results emerged from this study. First, the case study museums actively use their education collections to engage their community in programs. All of the museums discussed the programmatic benefits of having an education collection, and a few emphasized that they seek out opportunities in the museum to use the collection or that they generally do not refuse requests to use the collection. The education collection is meant to be used, and these museums make it a goal to use them. Macfarlane (2001) emphasizes the need for the education collections to tell the same story as the museum, which these institutions have done by tying the education collections so closely to the programmatic ventures.

Second, the aesthetics of objects in the education collection are considered. While participants from all museums did not mention this in such a way, the researcher determined that, from the few that did discuss the visual appeal of the objects, how pieces in the education collection look is important. Education collections are meant to stimulate and engage learners, and objects with aesthetic appeal encourage handling. This is not to say that every piece in the education collection needs to be visually stunning; rather, it means that objects that have been worn out or broken no longer hold the same appeal as they once did. For this reason, several of the institutions discussed wear and breakage as types of damage that would reduce the educational value of the collection. While Macfarlane (2001) and others (Keene, 2005; Van

Balgooy, 1990) have discussed the damage that comes from handling, the literature does not address the need to present a cared-for collection beyond stating that damage decreases the usefulness of these objects.

Third, while education collections are considered consumable collections, museums enact care in a variety of manners to prolong the usefulness of these specimens and objects. These institutions have developed handling guidelines, storage practices, loan procedures, and a number of other standards that help them maintain the objects and specimens within these education collections for as long as possible. The participants generally acknowledged that the value of the objects in the education collections is primarily programmatic or education and not scientific. This acknowledgment allows the museums to use these objects in hands-on experiences and other ways they would not use objects which are acquired to be held permanently for scientific research. Keene (2005) acknowledges that handling damages objects, but also expresses the opinion that greater use and greater care go hand in hand, suggesting that the more useful and the more used these collections are in museums, the more resources museums will dedicate to their care and continued use. Smith (2011) discusses the way that the Fort Worth Museum of Science and History has handled the management of their two collections, one touchable the other not, and believes that the benefits of using authentic objects in hands-on learning experiences outweighs the costs of maintaining those objects. This is a decision that institutions come to individually, assessing how damage happens to the objects and determining what it would cost to care for a collection that will continually be damaged by handling. The standards of care may not be equivalent to those afforded for permanent collections, and recommended by the *MRM5*, but the care these institutions enact seeks to mitigate sources of damage besides handling and to manage handling to prevent as much

unnecessary damage as possible.

Finally, it is clear that these four case study institutions are critically considering what it means for objects to be a part of the education collection. Maintaining an education collection composed of authentic objects and specimens forces museums to confront a variety of questions, including what level of care to enact for objects that are expected to break, how to assign value, and how to evaluate the benefits of the collection for learning. The case study museums answer these questions both formally and informally, and often at different levels within the institutions. While at times when directly questioned about such evaluations or considerations participants were unsure if such a matter was being discussed at their institution, it became clear in coding the data that these professionals address these issues in their practice. These institutions have accepted the responsibility of managing these education collections and, whether the education collections are accessioned or unaccessioned, whether they are stored in individual archival boxes or on shelves for easy access by educators, the professionals at these museums consider the museum's resources, the use of the collection, and seek to provide access to their collections, in line with the American Alliance of Museums (2008) Standards and Best Practices.

### **Implications**

In order to more fully understand research collections, research should be done with museums of a variety of types and sizes that manage education or other hands-on collections using authentic objects or specimens. Further research on this topic would benefit from a larger sample size, in order to elucidate more the breadth of what is being done in the field with regards to education collections, since not much of the literature directly addresses this topic.

There is not one standard for education collections, and there is not one way to manage a hands-on collection. Participants from four case study institutions presented six different

approaches to managing hands-on collections. Though these institutions do not share a set of practices, what they do share is a set of concerns, namely: that the objects fulfill an educational or programmatic need and that care for these objects should sustain their usefulness. Education collections at all the case study museums reflect the permanent or research collection to some extent, which is one way that these collections fulfill programmatic needs. The care for these collections is done with the understanding that the major cause of damage, or wear and tear, will be from their use. In general these institutions attempt to care for these objects in such a way that damage is minimized. This includes developing handling protocols and guidelines so that more fragile objects can still be used in the hands-on collections without fear of too much damage.

In the end, objects in education and hands-on collections are chosen because they advance learning or benefit a program. When museums choose to use authentic objects, there are a lot of questions that the museum will need to answer regarding how the collection will be cared for and how the collection will be used. These collections offer immense benefits to the museums that use them, enhancing programming and engaging visitors in ways that static exhibits can not. For museums that manage education collections, it is necessary to consider what value these collections have and how to best make use of that value, both in preservation and in utilization.

Going forward, it is my opinion, based on the interviews conducted and the documents reviewed for this study, that there are no set standards in the field for education collections, yet, and that is just fine. When preserving artifacts for posterity in perpetuity, as museums promise to do for their permanent and/or research collections, literature in the field supports a set of standards and practices that offer museums the best ways to do so. However, with education collections, since they are meant to be handled, and expected to be broken and consumed by use,

these standards do not apply in the same way. Does storing education collections in archival materials promote longevity? Probably yes, as long as the museum recognizes that the damage expected is not related to the environment but related to the handling. Does having handling guidelines and training for educators promote longevity? Probably, as long as the museum recognizes that guidelines and training do not prevent damage from occurring; rather, training and handling guidelines provide a way for the museum to manage how the education collections are used. Participants indicated they understand that, for the education collection, handling is the greatest danger, and they accept this danger. They are willing to put authentic objects into the hands of five-year-olds because they believe in the power of the learning experience that results.

It seems to me that what matters most is not necessarily housing or handling guidelines, or curatorial oversight, or any of the particulars of care practices that emerged in this study. What matters most at this juncture, since education collections are not highly formalized or well researched in the field, is that each museum that chooses to operate an education collection decides how to care for it and how to use it. Rather than recommend that all museums use archival materials to house their education collections, I would recommend that each institution consider what resources it can devote to housing an 'expendable' collection, and also to determine how the collection will be accessed by educators or borrowers, since this too may have an impact on how the objects are housed.

As the above example demonstrates, it is not my intention to lay out the dos and don'ts of education collections management. Instead, I propose a few considerations for museums deciding the care/use balance for education collections at their institution.

- 1) Consider your capacity.

This can include questions of allocating staff time for the education collection, as well as

how much money can be designated for education collections care, repair, replacement, etc. This study shows the importance these four institutions place on caring for their respective education collections, but these museums have also decided that, of the collections at the museum, the research and permanent collections take precedence. Considerations of capacity can also include questions of whether or not to accession the education collection. Generally, education collections are not accessioned, and the field accepts this as a standard practice. However, the Denver Museum of Nature and Science does accession to provide an extra level of security and legal protection for the collection. This decision also means that they have greater accountability and responsibility for the education collection than they would for an unaccessioned collection.

2) Consider your use of the collection.

As discussed in Chapter 4, usefulness in programming is a key component of selecting objects for the education collection. It follows that education collections should shift to reflect the needs and uses of the educators, being the more adaptable of the museum's collections. If the objects in the education collection are undesired by educators, they will be neither used nor valued. The museums in this study have education collections that attempt to represent the permanent collection, so they tell the same story as the museum as a whole (Macfarlane, 2001). It is likely the objects most reflective of the museum's mission and scope will be those which are useful in programming. When considering what use your institution does or will make of the education collections, consider how often they will be used and how many people will handle them. Think about how to talk to educators or borrowers about the collection; ponder the ways in which you may be able to guide handling by housing or labeling an object. In a way, how much care will be needed for the collection depends on how much it is used. The more it is used, the more it is valued, the more care will be taken with the objects in the collection, a sentiment

expressed by Keene (2005).

It is my hope that this study will provide some guidance as to what considerations are important when managing an education collection to those natural history museums (and potentially other museums) that currently manage education collections or that are considering developing such a collection. Education collections may eventually reach a level of standardization in the field, and a set of best practices for education collections may be developed later. At present, however, I think the best approach is a careful consideration by each institution of what they can do with respect to how they care and use for the education collection. Each museum should decide for itself what level of care it can afford in terms of finances, staff time, and other such limiting factors. It is important to remember, also, that the care/use balance is just that: a balance. It cannot be care without use or use without care if the education collection is to be well-managed; it must be use and care.

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## Appendix A: Interview Guide

### Managing Education Collections: Care/Use Balance in Natural History Museums Interview Guide

Anna Goss // Email: goss.a.j@gmail.com

Thesis Adviser: Dr. Jessica Luke, Museology Graduate Program, University of Washington

Phone: 206-685-3496 // Email: jjluke@uw.edu.

I am asking you to participate in a research study that is part of my Master's Thesis work at the University of Washington. The purpose of this research is to examine the standards of care for education collections at natural history museums, as manifested in both formal and informal policies and practices. Your participation is voluntary. Refusal to participate will involve no penalty or loss of benefits, and you may discontinue participation at any time. As a reminder, the identity of your museum will be revealed in the final results of this study. This interview will be recorded, and I may quote you in my final paper. I will give you the opportunity to review any direct quotations before publication. If you have any questions now or in the future, you may contact me or my adviser using the contact information I have provided above and will leave with you. Do you have any questions? Do you agree to participate in this interview?

#### Interview Questions

*My first few questions are designed to get some background information on the education collection at (Name of Museum).*

How long has (Name of Museum) had an education collection?

When was it first started? What was the impetus?

Can you generally describe the nature of the collection?

Why does (Name of Museum) have an education collection? What is its purpose?

*Next, I'd like to ask about how your institution cares for the education collection.*

Does (Name of Museum) have any policies that inform the care of the education collection? If yes, can you describe those policies? If no, why is that the case?

Is (Name of Museum) considering developing a policy (OR adding to existing policies)? What would this policy (OR these policies) say about care and use of the collections?

Is the education collection accessioned? What is the reasoning behind this choice? What does it mean for the collection?

What kind of documentation does (Name of Museum) maintain for the education collection?

What factors determine if objects go into the education collection? Who decides?

What factors are considered to decide when an object is no longer part of the education collection? What are (Name of Museum)'s practices regarding repair, replacement, and disposal (or deaccessioning)?

How does the museum care for the objects within the education collection?

What responsibilities do educators have for care and/or maintenance of the collection?

*The next few questions are about how your institution uses the education collection.*

Which museum programs and which clients of (Name of Museum) use the education collection? In what ways? How often?

How do the departments responsible for the education collection decide when to use it?

What are (Name of Museum)'s goals in using the education collection?

What are benefits of the education collection for staff, visitors, and the community?

What challenges does (Name of Museum) face with regards to education collections? What has been done to overcome some of those challenges?

*Finally, it seems to me that education collections might pose a particular challenge for museums and that each museum has to evaluate the costs and benefits, such as whether the education benefits of hands-on experiences outweighs the cost of damage to the object.*

Has (Name of Museum) conducted this sort of cost-benefit analysis (either formally or informally)? What reasoning underlies your institution's analysis and/or decision?

**Appendix B: Coding Rubric Research Question 1**

<b>How do natural history museums care for education collections?</b>	<b>Cincinnati Museum Center</b>	<b>Denver Museum of Nature and Science</b>	<b>North Carolina Museum of Natural Sciences</b>	<b>National Museum of Natural History</b>
<p><b>Standards of Care</b></p>	<ul style="list-style-type: none"> <li>- divided into two portions, one under curators, one under educators, depending on whether item was accessioned historically</li> <li>- in process of formalizing responsibility for care of ed. collections (6)</li> <li>- some of collection accessioned because it was accessioned historically, some not accessioned (7A)</li> <li>- new items that come into the ed. coll. are not accessioned, but legally acquired (7B)</li> <li>- the museum collections policy applies in general, so when applicable, those policies are followed (10B)</li> <li>- person in charge of collection is an educator (12)</li> </ul>	<ul style="list-style-type: none"> <li>- ed. coll. adhere to long term collections and research plan and research and coll. policy and procedures (5)</li> <li>- consistently update policies (every few years) and ed. coll. are a part of those policies (6)</li> </ul>	<ul style="list-style-type: none"> <li>- Nat. Center has protocols for pest control, specimen repair, documentation, and care (5)</li> <li>- Nat. Center coll. not for loaning external to museum, but can be borrowed within the museum (5)</li> <li>- both Nat. Center and Teaching Coll. have overall guidelines, though the guidelines differ (5)</li> <li>- Nat. Center follows policies of research collections and research curators (5)</li> <li>- Teaching Coll. either acquired or accessioned, Nat. Center most likely accessioned (7A)</li> </ul>	<ul style="list-style-type: none"> <li>- collections management policy specifically for ed. collections in alignment with museum's research collections policy (5)</li> <li>- policies updated on a periodic basis and with respect to changes in practice based on experience (5)</li> </ul>
<p><b>Care Practices</b></p>	<ul style="list-style-type: none"> <li>- not same level of care as permanent collection objects (5)</li> <li>- current practices of care may be revised due to change in use of collection in upcoming years (6)</li> <li>- when objects are acquired,</li> </ul>	<ul style="list-style-type: none"> <li>- objects accessioned and deaccessioned to maintain professional museum collections care standards (5)</li> <li>- an accessioned collection (7A)</li> <li>- not everything is accessioned -</li> </ul>	<ul style="list-style-type: none"> <li>- pest control policies (5)</li> <li>- temperature and humidity monitored in Nat. Center (5)</li> <li>- freezing of specimens that</li> </ul>	<ul style="list-style-type: none"> <li>- ed. collection is acquired, not accessioned, but museum still gets full legal title to objects (7A)</li> <li>- catalog and track education collections (7B)</li> <li>- different documentation to</li> </ul>

	<p>same legal documents for acquisition are used, but the objects aren't accessioned (8)</p> <ul style="list-style-type: none"> <li>- items damaged beyond usefulness are deaccessioned or disposed of, whichever is applicable (10B)</li> <li>- objects removed from education collection ideally transferred to other institution/org. (10B)</li> <li>- items observed when departing and reentering the collection for changes in condition (12)</li> </ul>	<p>occasionally replicas, casts, or reproductions are acquired and not accessioned (7B)</p> <ul style="list-style-type: none"> <li>- documentation kept to validate acquisition legally, whether item is accessioned or not (8)</li> <li>- deaccessions from ed. coll go through same process as deaccessions from research collections - to a committee to approve and then to decide the disposition (10B)</li> <li>- if possible, objects removed from collection transferred to other institutions (10B)</li> <li>- replacement tends to be opportunistic, esp. when items are expensive to replace (10B)</li> <li>- part of museum wide IPM (11)</li> <li>- limit exposure to dust and RH changes (11)</li> </ul>	<p>come into the collection through the Nat. Center (5)</p> <ul style="list-style-type: none"> <li>- TC - all bar-coded and entered into a database to facilitate tracking of specimens (8)</li> <li>- inventory of specimens being digitized with information regarding specimen location in Nat. Center (8)</li> <li>- deaccessions / disposals go through research collections</li> </ul>	<p>research collection, such as acquisition as opposed to accession records (8)</p>
<b>Storage</b>	<ul style="list-style-type: none"> <li>- most kept w/in subject area collections storage on separate shelving from bulk of research collection (5)</li> <li>- accessioned portion kept in cabinetry and archival boxes like perm. coll. and monitored similarly (11)</li> <li>- non-accessioned portion kept in cabinets and on shelves in Rubbermaid containers or similar boxes in a locked room (11)</li> </ul>	<ul style="list-style-type: none"> <li>- some items kept in cases due to assessment when it arrived regarding handle-ability (11)</li> <li>- storage is to mitigate other sources of damage to the object that aren't handling (11)</li> <li>- attempt to use best practices in storage, but not overly concerned about storage materials, since real danger is in handling (11)</li> </ul>	<ul style="list-style-type: none"> <li>- TC - combination of open metal shelving and cabinets with drawers (11)</li> <li>- TC: items damageable by pests kept in mostly bug-proof cabinets (11)</li> <li>- TC: one single room, locked (11)</li> </ul>	<ul style="list-style-type: none"> <li>- in Q?rius, storage containers chosen that can withstand large amount of handling (11)</li> </ul>

	<ul style="list-style-type: none"> <li>- when being borrowed by educators, there are locked closets and such areas for the items to be kept while out for use (12)</li> </ul>	<ul style="list-style-type: none"> <li>- museum grade shelving units, sturdy mounts made when applicable, volara, blue board used (11)</li> <li>- when educators have items out, the objects are to be kept in secure locations, e.g. locked closets, and to be packed as carefully back into the coll. as they were out (12)</li> </ul>	<ul style="list-style-type: none"> <li>- NC: mix of storage due to nature of center which leaves some specimens more exposed than others (11)</li> <li>- NC: Delta Cabinets, plastic dishes/tubes/boxes (11)</li> </ul>	
<b>Legal and Stewardship</b>	<ul style="list-style-type: none"> <li>- some items in the education collection need to be accessioned because of their status as federally regulated (7B)</li> <li>- some deaccessioned or disposed of items must be returned to a federal entity (10B)</li> </ul>	<ul style="list-style-type: none"> <li>- accessioning the collection provides a certain amount of legal/professional protection, esp. dealing with cultural artifacts and regulated species (5)</li> <li>- importance of tracing the legal history of certain specimens, like endangered or protected species (7B)</li> <li>- follow federal requirements regarding disposition of regulated species (10B)</li> </ul>	<ul style="list-style-type: none"> <li>- acquisition status of specimens so museum has clear ownership and can govern future use (7A)</li> <li>- don't accept regulated species that lack proper documentation (7A)</li> <li>- TC - donation papers state how the objects are going to be used (7A)</li> <li>- deaccessioned regulated materials return to federal agency (10B)</li> </ul>	<ul style="list-style-type: none"> <li>- legally owned by the museum and governed by the same policies, but not accessioned (7B)</li> <li>- may return items to the research collections if the research curators make a request for something that has value to science and should be in ed. coll. (10B)</li> <li>- Q?rius collections were evaluated for clear legal title before incorporated into the exhibit (11)</li> <li>- items not easily replaced or highly regulated have more handling restrictions due to legal considerations (11)</li> </ul>
<b>Preservation</b>	<ul style="list-style-type: none"> <li>- take preventative care measures to extend usefulness, but don't have financial means for conservation-level treatment of ed. coll (10B)</li> <li>- dusting and general cleaning of objects done if necessary (11)</li> </ul>	<ul style="list-style-type: none"> <li>- treat objects, esp. endangered species, with care because while they will be used, consumption is not a good option for some things (5)</li> <li>- preservation, including repair, is done with the goal of</li> </ul>	<ul style="list-style-type: none"> <li>- informal policy re: repairs in Teaching Coll. (5)</li> <li>- repair items in Teaching Coll. on an irregular basis, after</li> </ul>	<ul style="list-style-type: none"> <li>- repair is attempted on broken items (7B)</li> <li>- repair of specimens used as training for conservation interns</li> </ul>

	<p>- items sometimes repaired if possible to extend programmatic usefulness (10B)</p>	<p>maintaining object's integrity for education, not science (10B)</p> <p>- volunteers trained in repair techniques (10B)</p>	<p>enough damaged items have accrued or if something important is damaged (5)</p> <p>- TC repair done with aid of research and exhibits staff; replacement on a budgetary basis (10B)</p> <p>- TC volunteers and staff trained on proper care and use, including what is an is not touchable, and how to enforce guidelines (12)</p> <p>- NC volunteers and staff trained regarding what to do when objects damaged and how to facilitate proper use (12)</p>	<p>at the museum (10B)</p> <p>- incorporate conservation best practices in terms of fixing and housing (11)</p> <p>- Q?rius collections assessed for preservation, quality, and fragility of specimen before being incorporated into the exhibit (11)</p>
<p><b>Managing Use (General)</b></p>	<p>- track use and loans of ed. coll. objects in database to maintain control over collection and to know where items are (8)</p> <p>- long term goal of deaccessioning accessioned items that are used often into ed. coll. (11)</p> <p>- informal training for those who borrow the collection that covers care and handling of the object while it's in their possession (12)</p>	<p>- a hands-on and consumable collection, to an extent, but housed under research/collections due to need for oversight (5)</p> <p>- those who borrow from the ed. coll. have to come into the museum for training regarding handling and care (5)</p> <p>- educators are an extension of collection staff when they are using education collections - responsible for modifying damaging behavior (12)</p> <p>- training given to educators before they can borrow objects, covering handling, care, and what to do if something breaks (12)</p> <p>- educators responsible for</p>	<p>- guidelines for users and how specimens are to be used (5)</p> <p>- visitors get a brief orientation to Nat. Center before entering (5)</p> <p>- staff supervision in Nat. Center (5)</p> <p>- use database to track use of specimens, check-outs, etc (8)</p> <p>- track number of people using</p>	<p>- Q?rius collection digitized - all documentation, including images, available online for Q?rius exhibit (8)</p> <p>- public trained when they enter the Q?rius collection and the collections area is always staffed to facilitate and guide handling and use in that area (10B)</p> <p>- educators have responsibility to teach visitors how to handle objects with respect and care and to oversee activities in which objects are used (12)</p> <p>- substantial training program for volunteers and staff of Q?rius regarding handling and facilitating use in the exhibit (12)</p>

		<p>careful handling with the public and reporting broken specimens (12)</p> <p>- educators expected to understand how to handle objects and the fragility of objects they do take out (12)</p>	Nat. Center (8)	
<b>Managing Use (Handling)</b>	<p>- handling policies not as stringent for ed collection (5)</p> <p>- handled with gloves and treated respectfully within collection (11)</p> <p>- understanding that the items will be handled by people without professional training (11)</p>	<p>- touch-ability levels follow a stop-light code green: touch &amp; handle responsibly; yellow: use a few fingers to touch; red: do not touch; blue: either volunteer only or do not open, but look (5 &amp; 11)</p> <p>- tutorial on safe handling techniques to minimize damage (10B)</p> <p>- adjust handling codes depending on damage to the object - may increase handling restrictions if an object has been damaged (11)</p>	- have different levels of handling and alert borrowers to those levels for objects (5)	- touch-ability scale follows stop light: green: touch; yellow: can touch with volunteer assistance; red: look, but do not touch (11)
<b>Managing Use (Safety)</b>	- potentially hazardous materials (e.g.. arsenic-treated items) kept on curatorial side of things (5)	<p>- objects tested for presence of hazardous materials or evaluated for safety of handling for other reasons (5)</p> <p>- assessment upon accession of handle-ability, including fragility, hazardous materials, sharp, break-ability, and other risks (11)</p>		<p>- important to keep both objects and visitors safe (11)</p> <p>- items treated with hazardous materials are not allowed to be touch for visitor safety reasons (11)</p> <p>- ?rius collections evaluated for safety before incorporated into the exhibit - what dangers to objects pose to visitors (11)</p>
<b>Expectations of Loss</b>	- because of the expectation that items in the ed. collection will	- it is expected that over the lifetime of objects in the ed.	- teaching collection is expected to be used a lot and that items	- items not accessioned into the ed. coll. because of expectation of

	<p>be damaged or destroyed, these items are not accessioned (7B)</p>	<p>collection they will be damaged beyond repair due to handling and use for educational purposes (7B)</p> <ul style="list-style-type: none"><li>- general understanding that things will break, try not to have a negative response when something does break (10B &amp; 12)</li><li>- how long an item can be expected to last in the ed. coll. depends on several factors, but they aim for long use (decades) using proper touching conditions (11)</li><li>- breakage is an accepted risk (12)</li></ul>	<p>will need to be replaced due to damage (11)</p>	<p>damage and eventual loss (7A)</p> <ul style="list-style-type: none"><li>- expectation of 20000 people handling Q?rius objects in a year, so prepared for damage to happen (11)</li></ul>
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**Appendix C: Coding Rubric Research Question 2**

<p><b>How do these museums decide what to incorporate into and what to remove from the education collection?</b></p>	<p><b>Cincinnati Museum Center</b></p>	<p><b>Denver Museum of Nature and Science</b></p>	<p><b>North Carolina Museum of Natural Sciences</b></p>	<p><b>National Museum of Natural History</b></p>
<p><b>Usability</b></p>	<ul style="list-style-type: none"> <li>- programmatic use as opposed to scientific use (9)</li> <li>- have to be useful for programs to justify keeping (10A)</li> </ul>	<ul style="list-style-type: none"> <li>- major criteria for accepting an object is usefulness in program (9)</li> <li>- judge accessions by education department programs and long term collections and research plan (9)</li> <li>- value and appropriateness (9)</li> <li>- Educator's express needs for programs (9)</li> <li>- teaching point in tact even though aesthetic appeal damaged (10A)</li> <li>- need to be using on a regular enough basis (i.e. once every two years) (10A)</li> <li>- educators thinking about how to capitalize on the collection to advance the learning that happens in the museum (14)</li> </ul>	<ul style="list-style-type: none"> <li>- usability part of the consideration to take specimens (9)</li> <li>- use education staff input to determine if taking something in is worth the resource expenditure (9)</li> <li>- items need to be appropriate for the collection (9)</li> <li>- items not useful for education or unable/unappealing to be handled may be removed or replaced (10A)</li> </ul>	<ul style="list-style-type: none"> <li>- items added at present because of needs of an educator for a program (9)</li> <li>- safe to handle for the public and the object (9)</li> <li>- learning value of the object (9)</li> <li>- it tells a good story (deduced - 10A)</li> <li>- an item may have a good enough story to be the basis of a program (14)</li> <li>- do the objects help achieve goals that the department has (14)</li> </ul>
<p><b>Object Condition</b></p>	<ul style="list-style-type: none"> <li>- unnecessary multiple or duplicate of material in the research collection (9)</li> </ul>	<ul style="list-style-type: none"> <li>- opportunistic replacement of specimens that are contaminated (9)</li> </ul>	<ul style="list-style-type: none"> <li>- should be pest free (9)</li> </ul>	<ul style="list-style-type: none"> <li>- acquire full legal title (9)</li> </ul>

	<ul style="list-style-type: none"> <li>- not high enough quality for research collection (9)</li> <li>- damaged from research but not so damaged as to necessitate deaccession and disposal - still had possible programmatic use (9)</li> <li>- one of the biggest factors, includes breakage and safety concerns (10A)</li> </ul>	<ul style="list-style-type: none"> <li>- active collection of easily damaged specimens (i.e. insects) (9)</li> <li>- aesthetic appeal, both inherent to the specimen, and from it not being broken too much (10A)</li> <li>- worn out such that it has no educational value remaining (10A)</li> </ul>	<ul style="list-style-type: none"> <li>- item quality (9)</li> <li>- good condition (9)</li> <li>- specimens without data (9)</li> </ul>	<ul style="list-style-type: none"> <li>- aesthetically appealing / attractive (18)</li> </ul>
<b>Oversight</b>	<ul style="list-style-type: none"> <li>- departmental curator makes the decision for what is added to the education collection (9)</li> <li>- decision approved by staff committee (9)</li> <li>- registrar, curators, and education collections manager (currently an educator) (9)</li> </ul>	<ul style="list-style-type: none"> <li>- curator's decision (9)</li> <li>- accessions to education collection go to relevant research coll. curator first (9)</li> <li>- programmer's have needs for programs, curator's give okay for accessions (9)</li> <li>- curators decide an object is not appropriate for the ed. collection (10A)</li> </ul>	<ul style="list-style-type: none"> <li>- everything brought in by the Naturalist Center goes to the curators first (9)</li> <li>- curator of Naturalist Center makes acquisition decision for the Center (9)</li> <li>- Teaching Collection head and assistant make decisions for teaching collection acquisitions (9)</li> <li>- Teaching Collection interested in developing a committee to advise on acquisitions (9)</li> </ul>	<ul style="list-style-type: none"> <li>- committee oversees acquisitions, composed, on a changing basis, of a variety of staff members (9)</li> <li>- research departments reviewed ed. collection prior to Q?rius to suggest best objects to use (10A)</li> <li>- analyze a combination of multiple factors to determine if something should be acquired (14)</li> </ul>
<b>Exclusion Criteria</b>	<ul style="list-style-type: none"> <li>- not safe for handling (9)</li> <li>- not useful for programming (9)</li> </ul>	<ul style="list-style-type: none"> <li>- culturally inappropriate or culturally stereotypical (10)</li> <li>- lack of aesthetic appeal (10A)</li> <li>- broken too many times (10A)</li> </ul>	<ul style="list-style-type: none"> <li>- poor condition (deduced - 9)</li> <li>- damaged specimens (10A)</li> </ul>	<ul style="list-style-type: none"> <li>- too valuable to be used with the public (research or monetary) (9)</li> <li>- unsafe to use with public in a hands-on manner (9)</li> <li>- too damaged by handling to be useful (10A)</li> <li>- too fragile and easily damaged to be used hands-on with the</li> </ul>

				public (18)
<b>Capacity</b>	<ul style="list-style-type: none"> <li>- ideally, items unused in programming removed to free up resources (10A)</li> <li>- informal process of assessing resources that remain and determining if ed. collections are where they should go (18)</li> </ul>	<ul style="list-style-type: none"> <li>- space is a major consideration (9)</li> <li>- responsibility to offer protection for specimens, without immediate need (9)</li> </ul>	<ul style="list-style-type: none"> <li>- storage capacity assessed for potential acquisitions (9)</li> <li>- try to assess before acquiring an object whether there are adequate resources to maintain it (18)</li> </ul>	<ul style="list-style-type: none"> <li>- determine if an item is worth the cost of housing and repairing (18)</li> </ul>
<b>Cooperation between departments</b>	<ul style="list-style-type: none"> <li>- receptive to requests from education programs, accommodating (14)</li> <li>- programming supposed to be created around artifacts (14)</li> <li>- majority of floor programming makes use of hands-on materials (14)</li> </ul>	<ul style="list-style-type: none"> <li>- ed. coll. get first dibs on items deaccessions from research collections (9)</li> <li>- educators express wishes for accessions to ed. collection for programmatic purposes (9)</li> <li>- when disposing of material, research collections get first dibs (10A)</li> <li>- reputation for helping departments augment almost anything they do (14)</li> <li>- coordinate with programs to determine needs in advance to avoid conflicts with object use (14)</li> <li>- ed. coll. actively pushes use, and other staff know to seek out ed. coll. if they need something (14)</li> <li>- a curated collection and part of education and outreach efforts, which puts ed. coll. in the space between research and outreach (18)</li> </ul>	<ul style="list-style-type: none"> <li>- consult with education staff regarding acquisitions (9)</li> <li>- trickle down of specimens from research to Naturalist Center to teaching collection (9)</li> <li>- specimens not useful for research (no data or duplicates) get transferred to other collections (9)</li> </ul>	<ul style="list-style-type: none"> <li>- research departments review all incoming material and get first dibs (10A)</li> <li>- research departments can seek return of items from ed collection that are unique or valuable for research (10A)</li> <li>- research collections will offer items to E&amp;O when deaccessioning or disposing (14)</li> </ul>

**Appendix D: Coding Rubric Research Question 3**

<b>What are the institutional benefits and limitations associated with maintaining and education collection?</b>	<b>Cincinnati Museum Center</b>	<b>Denver Museum of Nature and Science</b>	<b>North Carolina Museum of Natural Sciences</b>	<b>National Museum of Natural History</b>
<b>Programmatic / Engagement</b>	<ul style="list-style-type: none"> <li>- using education collections opens more opportunities that would not have been available using just research collections (4)</li> <li>- support educational programs (4)</li> <li>- variety of educational programs including enactors, learning lab, nature's trading post, outreach (13)</li> <li>- story-telling with objects, using the object's story for learning (16)</li> </ul>	<ul style="list-style-type: none"> <li>- education collection used to respond to all sorts of programming needs, esp. needs the research collection cannot for preservation reasons/other concerns (4)</li> <li>- these objects can be used for teaching and as loans to augment extra-museum programming and ignite interest in nature and science (4)</li> <li>- almost every department in the museum has made use of the education collections (13)</li> <li>- enactor program, off-site loans, on-site programming, development activities (13)</li> <li>- reaching up to 600,000 people per year and in use every day of the week (13)</li> <li>- augment exhibits, including traveling exhibits (13)</li> <li>- object-based, object-driven inquiry - can provoke questions, stimulate discussion (13)</li> </ul>	<ul style="list-style-type: none"> <li>- to support hands-on science programs (4)</li> <li>- to support scientific activities using collections (4)</li> <li>- variety of programs (13)</li> <li>- have worked with local universities (13)</li> <li>- broad reach that they imagine will expand in ways they cannot foresee (13)</li> <li>- to engage visitors with the natural world and science (15)</li> <li>- resource for staff for in-house programs (16)</li> </ul>	<ul style="list-style-type: none"> <li>- public programs, to give public access to collections in multiple ways (4)</li> <li>- for public to be able to engage with collections in a similar way to scientist with res. coll. (4)</li> <li>- Q?rius, a large center for engagement has a collections center (13)</li> <li>- staff help visitors to answer their own questions or to explore the collection (13)</li> <li>- increases public awareness of the importance of collections and the research done with them (15)</li> <li>- understanding about how and why collections and what can be learned (15)</li> <li>- use the stories of the scientists along with the collections objects to encourage engagement and foster learning (16)</li> </ul>

		<ul style="list-style-type: none"> <li>- outreach support for programs (15)</li> <li>- help teachers become better teachers and engage students to become scientists (15)</li> <li>- can relieve burden of research collections re: use (16)</li> <li>- teachers can borrow rare/expensive items they wouldn't otherwise have access to (16)</li> </ul>		<ul style="list-style-type: none"> <li>- share researcher expertise with the public (16)</li> <li>- objects provide direct evidence of the science (16)</li> </ul>
<p><b>The Real Thing / Experience</b></p>	<ul style="list-style-type: none"> <li>- the ability to use real objects sets the museum apart from other learning opportunities (4)</li> <li>- reifies abstract concepts - makes difficult ideas more immediate by giving a physical contact/context (16)</li> <li>- using education collections to create authentic experiences with a 'wow' factor that is possibly more memorable and more impactful than just looking at exhibits (15)</li> <li>- the opportunity to experience real things, a real piece of history (15)</li> </ul>	<ul style="list-style-type: none"> <li>- a deeper connection by using a physical object and physical contact/proximity (13)</li> <li>- reality in the world of the meta-real (15)</li> <li>- irreplaceability of encounters with real objects, more memorable/relevant than seeing objects behind glass (15)</li> <li>- value of the collection is in the ability to touch it (16)</li> <li>- augments the experience for those of different learning styles (16)</li> <li>- personal experience (16)</li> <li>- novelty and interest of the objects themselves (16)</li> </ul>	<ul style="list-style-type: none"> <li>- memorable experience (16)</li> <li>- unique connection to nature (16)</li> <li>- up close encounter with an object makes understanding something more tangible (16)</li> <li>- different to seeing something on a screen (16)</li> </ul>	<ul style="list-style-type: none"> <li>- an encounter with a real thing is part of why people visit museums, so ed coll. give even more than an exhibit in that regard (16)</li> <li>- handling an object allows visitors to learn in ways they can't just by looking at something behind glass (16)</li> <li>- a unique opportunity to touch what they may have only seen in images (16)</li> </ul>

<p><b>Challenges</b></p>	<ul style="list-style-type: none"> <li>- funding / finances - financial considerations to growing the collection are a challenge to consider moving forward (17)</li> <li>- balancing educational demands with collections preservation, not just in ed. coll, but overall (17)</li> <li>- tracking collections objects, esp. those in the accessioned portion of the ed. collection that do not have a standing research curator (17)</li> <li>- control - including tracking (17)</li> <li>- space</li> <li>- staffing</li> <li>- quantity of objects</li> </ul>	<ul style="list-style-type: none"> <li>- precautions / care / storage to ensure longevity (4 / 13)</li> <li>- situating the department between research and programs, since it is not either, but a little bit of both - where do education collections fit? (17)</li> <li>- collections not conveniently located to programming space (17)</li> <li>- space -- appropriate (17)</li> <li>- staff (17)</li> <li>- funding (17)</li> <li>- availability of staff (17)</li> </ul>	<ul style="list-style-type: none"> <li>- space (17)</li> <li>- dealing with wear and tear and still keeping to standards (17)</li> <li>- managing specimens to prevent damage as much as is possible (17)</li> <li>- budget (17)</li> <li>- staffing (17)</li> <li>- replacement costs (17)</li> <li>- safety of collection to be handled by people, not just visitors (17)</li> <li>- organizing and focusing the collection (17)</li> <li>- tracking items (17)</li> <li>- pest management and trying new systems of IPM (17)</li> <li>- control -&gt; inventory (17)</li> <li>- time to do everything (17)</li> </ul>	<ul style="list-style-type: none"> <li>- handling on a large scale (13)</li> <li>- conveying why collections are important and what can be learned in them in a compelling manner (16)</li> <li>- wear and tear as a result of large scale handling (17)</li> <li>- messaging well to the public regarding collections and research (17)</li> <li>- ability to care for collections (17)</li> <li>- balance between accessibility and stewardship (17)</li> </ul>
<p><b>Mission / Alignment</b></p>		<ul style="list-style-type: none"> <li>- serve as a reminder that the museum is also about the stuff, the specimens and the</li> </ul>	<ul style="list-style-type: none"> <li>- supports the mission of the museum to enhance understanding and</li> </ul>	<ul style="list-style-type: none"> <li>- makes the research done behind the scenes more visible to the public (4)</li> </ul>

		<p>objects (16)</p> <ul style="list-style-type: none"> <li>- furthers the museums mission of being a catalyst for science in the community (4)</li> <li>- goal is to build a future generation of scientists and to encourage preservation of collections (13)</li> <li>- helps show the other, more behind the scenes work of the research collections to the public (16)</li> </ul>	<p>appreciation of environment (15)</p>	<ul style="list-style-type: none"> <li>- shows the public the reason behind the museum's existence and teaches about how collections are used (15)</li> <li>- convey the importance of collections (16)</li> <li>- a way to convey value of objects and therefore the museum as the guardian of these objects (16)</li> </ul>
<b>Accessibility</b>		<ul style="list-style-type: none"> <li>- ed. collections are how the collections go out to the public (4)</li> <li>- goal: to be totally open and approachable by any/everybody (16)</li> <li>- staff put in time on some weekends and before/after hours so collection can be accessed (17)</li> </ul>	<ul style="list-style-type: none"> <li>- Nat. Center open 7 days a week, Museum has programs 7 days a week (13)</li> </ul>	
<b>Use of Collections</b>	<ul style="list-style-type: none"> <li>- use education coll. in spaces that research/permanent coll. could not be used (16)</li> </ul>		<ul style="list-style-type: none"> <li>- research coll. pass specimens to Nat. Center (4)</li> <li>- Nat. Center acts as public facing coll. and accepts donations which are passed to research (4)</li> </ul>	