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A Learning Research Agenda for Natural History Institutions

Introduction

Museums and other institutions with natural history collections occupy a unique place in the UK's cultural landscape. They are hugely popular with schools, families and adults, with attendance figures growing year on year[i].

Although one might think about natural history institutions as being mostly about the past, they are increasingly called on to play a critical role in preparing citizens for an uncertain future. We face a series of 'wicked problems'[ii] such as climate change, biodiversity loss and food security. Helping citizens to understand and respond to these threats is one of the most important challenges for public education in the twenty-first century. Rising to this challenge requires that natural history institutions and learning researchers work together to deepen and extend our knowledge of how best to support visitor learning. We need to get better at communicating complex scientific content in ways that are understandable and actionable by visitors from a wide range of diverse backgrounds, including those who have traditionally been less involved with science. Our museum collections contain critical evidence about wicked problems we face, yet we struggle with creating learning experiences beyond our traditional comfort zones of systematics, evolution, and general science education.

The field of natural history learning needs a reconceptualisation of visitor learning and engagement underpinned by a new research agenda reflecting the interactions between a museum's collections, its staff and its scientific content. Although research has been conducted on topics such as visitors' understanding of evolution[iii], family interactions[iv] and school trips[v], the vast majority has been conducted in the USA, leaving learning in the UK natural history museum context relatively under-researched and under-theorised. A learning research agenda could also support the work of natural history organisations worldwide, helping them create learning experiences that would empower their own visitors to grapple with twenty-first-century wicked problems.

Understanding the full impacts of museums is challenging. The sector lacks an understanding of its medium- and long-term impacts[vi] and there is debate as to what kind of impact should be expected of museum experiences. Although small-scale evaluations have occurred across these settings, they have often focused on visitor satisfaction and delivery processes. The Wellcome Trust's *Analysing the UK Science Education Community: The contribution of informal providers*[vii] has also signposted new directions – strongly emphasising the need for a collaborative research agenda and a systematic approach to evaluation in informal science education, including natural history museums. A coherent, theoretically informed research agenda would greatly enhance our field's ability to respond to twenty-first-century challenges, drive innovation, assess our true impact and communicate clearly to stakeholders in policy, science and education about the value of natural history institutions.

Towards a collaborative research agenda

The Natural History Museum, London, King's College London and the University of Bristol, funded by the Economic and Social Research Council, have facilitated a series of six seminars, over two years, to build a collaborative and theoretically informed learning research agenda for natural history museums[viii]. Museum learning practitioners and academics from a number of disciplines across the UK have come together to examine the complexities of learning in rich natural history environments.

The process involved identifying and discussing problems of practice, collecting examples of extant research and practice, identifying relevant academic disciplines and theory that could potentially be relevant to practice, collaborating on joint research projects, and discussing ideas about how an agenda could help to bring together research and practice and guide the field into the twenty-first century. Crucially, these seminars allowed participants to hear from researchers and practitioners working across the UK and internationally and to consider a range of theoretical lenses through which to view learning in natural history environments.

What emerged from this process was the realisation that in order to be effective, a learning research agenda must be flexible and speak to the differing needs of various stakeholder groups – in particular, practitioners (generally based in natural history institutions), researchers (often, but not always, in academic institutions) and administrators.

Practitioners seek:

- input into, awareness of, and agency around key learning challenges in natural history settings
- new ideas for programming or exhibition design
- evidence of the value of learning in natural history environments
- understanding of why certain practices work and under certain conditions
- ways to share their work with professional colleagues and develop their professional skills.

Researchers seek:

- a theoretically informed understanding of the sector and learning activity within it
- complex problems that will help drive their line of research forward and lead to potential breakthroughs in methods, theory, and intervention science
- opportunities for collaboration with practitioners and pathways for their research to directly influence practice
- research studies that will be publishable.

Museum administrators need:

- evidence to fundraise around
- evidence to manage around
- evidence of the credibility of exhibitions and activities
- a compelling and shared vision for the future of natural history museums that keeps them relevant and vibrant well into the twenty-first century, and that can catalyse rapid and widespread improvement in the sector.

The learning research agenda

The process of conversations, meetings and exploration by researchers and practitioners of natural history learning has led to a research agenda that is structured around the following major elements:

- a conceptual map of learning in natural history institutions
- problems of practice (ongoing conversations in the field)
- example research questions.

The agenda is intended to highlight key challenges for the field. It is not meant to be fixed; it is expected to change over time and to be used in different ways by different stakeholders.

A conceptual map of learning in natural history institutions

The map offers a straightforward way of looking at the complexity of practice, particularly in terms of identifying key research moments to study. It incorporates five interlinked and interactive dimensions in natural history learning experiences, all of which are situated within the broader context of the wicked problems confronting all of our visitors. At the map's core are collections, content and expertise, three dimensions that characterise the uniqueness of natural history institutions as distinct from other contexts for learning.

Collections

All natural history learning institutions have collections that are a resource that can be drawn upon by scientists, educators or the public to advance learning about the natural world. The collections reflect the fields of study, expertise and values as well as the history and geography of the institution.

Content

Objects and collections are explicitly linked to core natural history content. Contemporary content might include biodiversity, evolution, climate change and sustainability as well as processes of science (for example, modelling and hypothesising) and behaviours and values (for example, stewardship and conservation) associated with these areas.

Expertise

Natural history institutions have staff with specialised knowledge and skills related to content, collections and/or learning. Expertise is held by individuals who may include scientists, curators/collections managers, educators and experience developers who work to help audiences engage with the natural world. This expertise may be found within institutions or come from external collaborators.

Surrounding the core dimensions are facilitation and audience. Facilitation activates collections, content, and expertise for target audiences.

Facilitation

Facilitation transforms collections, content and expertise into learning experiences that reflect the needs and interests of audiences. Institutions facilitate learning in many ways, including face-to-face interaction (for example, talks, tours and workshops), exhibitions, interpretive signage, interactive displays, self-guided activities and social media. Facilitation can occur through both on-site and off-site programming.

Audiences

Audiences are distinct groups who may engage with content, collections and expertise through facilitated experiences. Audiences vary by institution and include, for example, families, educational groups, adults, specialist groups (for example, natural history societies, citizen science participants and policy-makers) and online visitors. Crucially, audiences include those groups whom the institution is already serving, as well as those it aspires to engage with in the future.

Learning experiences and research questions

The transects can be read as both specific learning experiences and as openings for research. A specific learning experience can be seen as a transect that crosses a number of dimensions. In order to develop a learning experience, the institution draws upon its core resources (collections, content, expertise) with very specific ideas of the target audience. The institution and the audience meet through facilitation. The impetus for engagement may come from the core institutional resources, and sometimes it can come from the audience interests or engagement, something that museums increasingly encourage. Done well, over time, both the institution and its audiences become more knowledgeable about, and connected to, each other. The institutional core should evolve to reflect its own commitments as well as those of the audiences it serves.

The transects depicted in the model also illustrate where there are openings for research. Designing learning experiences can be challenging, and there are many problems of practice that emerge. These problems may start in one dimension of the model but invariably cross others. The problems of practice form the base of the research agenda and highlight the complexities of learning and research in these institutions. The map is intended to scaffold the formulation or articulation of problems of practice, by providing coherency to the interacting conceptual elements of learning in natural history museums. It provides a grammar for asking potentially fruitful questions and guards against either researchers or practitioners framing things in ways that are too narrow to touch the active ingredients of any learning situation. We anticipate that the map will support the development of a common language and shared goals across the research–practice boundary.

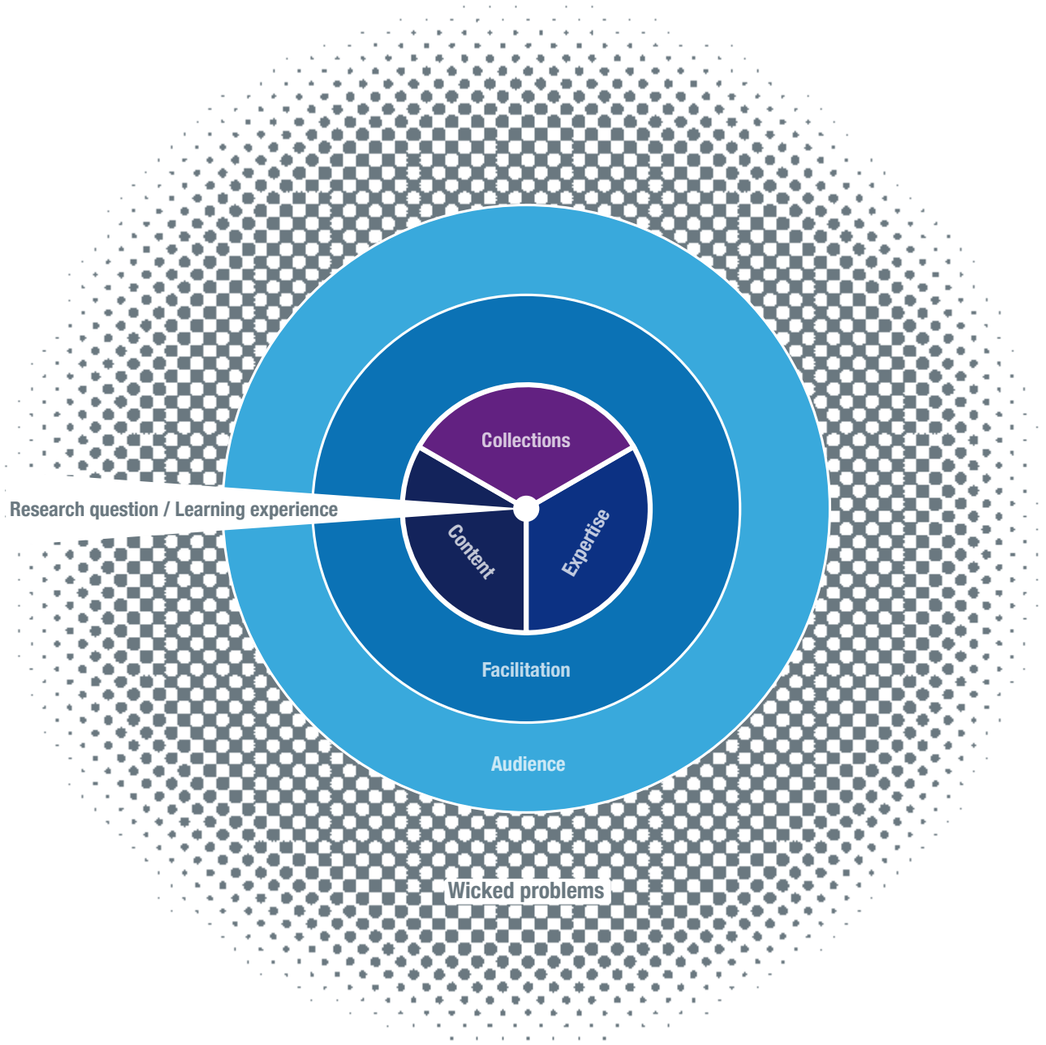


Figure 1: Conceptual map of learning in natural history institutions

Problems of practice and exemplar research questions

The focus for learning research is framed by challenges facing practitioners on a daily basis – 'problems of practice' – which are common across all natural history institutions. Structuring the agenda around these problems emphasises the importance of addressing specific, situated challenges, rather than more generic concerns or outcomes. Doing so also helps bridge research and practice, by providing a more specific focus for collaboration.

Problems of practice can be grouped according to the five interactive dimensions identified in the conceptual map: content, collections, expertise, facilitation and audiences. An understanding of these problems of practice leads to the identification of potentially fruitful research questions. To be useful, research questions would be developed in collaboration between researchers and practitioners. The questions should normally address content, collections or expertise, facilitation and audience to ensure that they focus on exploring learning in natural history institutions.

Problems of practice related to the five dimensions, along with example research questions corresponding to each, are described below and, together with the map, frame the learning research agenda.

Content – problems of practice

- The traditional core content of natural history institutions (origins and evolution, sustainability, diversity of life) and the nature of science are already conceptually complex. The urgency around new content related to twenty-first-century wicked problems compounds the complexity of the content with which we need to engage visitors.
- Visitors connect to content differently than do museum staff (such as through a cultural lens or a science lens). It can be hard for many visitors to identify the relevance of the content and collections to their lives.
- There is a gap between the science that museums do and care about and the object-based experience experienced by visitors. People see the objects before they appreciate the content.

Example research questions

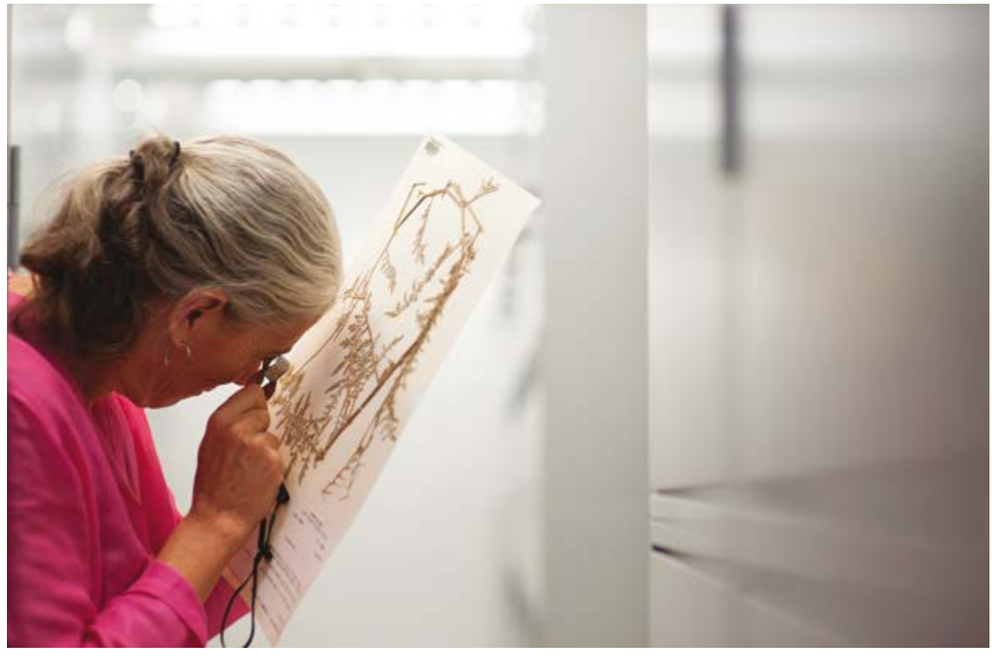
- What approaches to the teaching of biodiversity through objects are effective for a family audience?
- What role can user-generated content have in helping natural history institutions communicate about the urgency of climate change?

Collections – problems of practice

- We need to know more about how visitors learn science from collections and about the unique learning opportunities that may be afforded by a collection.
- We need to understand how people engage emotionally with the collections and how this engagement influences their learning.
- Concerns about 'authenticity' and how much it matters are increasingly important in a digital world. The field needs a better understanding of what is considered to be 'real' (in terms of objects and collections, as well as experts and data) and how learning is affected when objects of inquiry are digital and not physical. As systems thinking is a key piece of many twenty-first-century wicked problems, we need to understand how to connect objects with more dynamic technology experiences that make it easier to learn systems thinking.
- There are institutional boundaries around objects associated with authority and ownership that define what can be said about collections and which may discourage alternative interpretations of collections. As a result, visitors may be restricted in fully engaging with objects in ways that are meaningful to them.

Example research questions

- What understandings of 'real' are held by young children, parents and adults visiting a museum for the first time?
- How do these different understandings or meanings of 'real' affect different audiences' emotional responses to objects?






Expertise – problems of practice

- Natural history institutions need a deeper understanding of the most effective ways to enable scientists to engage effectively with the public (including a variety of audience groups).
- Natural history institutions have a workforce with diverse professional backgrounds. These individuals bring different understandings of what makes quality experiences for visitors. Institutions need to better facilitate the coming together of expertise and leverage it to develop innovative learning experiences.

Example research questions

- What models of professional development most effectively capture the varying expertise of gallery staff and leverage it to help them engage with under-served audiences?
- How does the inclusion of personal narratives by scientists change the ways audiences engage with lectures or facilitated conversations?

Facilitation – problems of practice

- Natural history institutions need to update their public engagement activities to reflect the latest knowledge of how people learn and take advantage of new opportunities created by digital technology, participation and co-creation (such as citizen science).
- Facilitation design makes assumptions about the knowledge, interests and motivations of different audiences. These assumptions create a barrier between facilitation and the visitor experience and interpretation. There may be problems of alignment between institutional expectations and visitors' expectations of facilitation.
- People's experiences with natural history institutions are part of a lifelong, life-wide and life-deep learning ecology in which they understand, develop interest in and build connections to the natural world. The field needs a richer understanding of where a visit fits into an individual's learning ecosystems. Such an awareness would also help institutions create more effective facilitation for learning about the natural world.

Example research questions

- To what extent does the use of digital technology based around living collections enhance or take over a learning experience for youth? How is an emotional connection affected by the use of technology? How can technology be leveraged to help focus attention on the subject (living things)?
- To what extent do visitors from diverse backgrounds connect their experiences on a visit to their own experiences with related content? What forms of facilitation might be deployed to help particular audiences make these connections?




Audiences – problems of practice

- The field would benefit from a robust understanding of visitors' and non-visitors' expectations, needs, identities, perceptions, experiences, values or interests at a level of detail that enables institutions to change practice.
- People who are already interested in natural history often choose to deepen their engagement with natural history through other channels than natural history institutions. We need a deeper and more nuanced understanding of what these audiences, as well as audiences newer to or less knowledgeable about natural history, seek from us and from the other channels with which they engage.
- Some audiences are under-served (for example, people with disabilities may not have ways of accessing collections; people from some local areas do not visit at all).

Example research questions

- How can we more usefully conceptualise people in terms of their concerns, interests and experiences with respect to the natural world rather than their demographics? How can we use knowledge of these needs, expectations and so forth to improve visitors' experiences?
- Urban audiences often have little knowledge of or connection to nature – what do institutions assume they bring? What do they actually bring? What design principles can be used to develop more effective ways to engage urban audiences with conservation?
- What kinds of natural history institutions/ experiences are best placed to serve visitors with particular sensory impairments?

Using the research agenda

Practitioners may use the agenda to situate the problems they are facing in a larger context. That is, while a particular issue or problem may seem very specific to their institution, the agenda may help frame it in a way that enables identifying links to other institutions or areas opening up the possibility of transfer across institutions, facilitating the development of a shared language and a stronger basis for learning from each other. This broader framing and consideration of problems also provides a stronger starting point for conversations with researchers.

For researchers, the agenda identifies the facets of learning in natural history environments and brings to the fore the problems of practice faced by those working in these contexts. This perspective on the field may, in turn, help them identify potentially fruitful areas of collaboration (i.e. based on challenges faced by practitioners) thus facilitating integration into the field. By articulating the problems of practice that the field is facing, the agenda acts to scaffold the development of useful research questions (those framed around at least three dimensions in the model – audience, facilitation and at least one of the core components). It may also help researchers link their existing interests with concerns faced by practitioners, as well as administrators, in natural history environments.

Within individual institutions, answers to the research questions that can be generated using the conceptual map have the potential to contribute to the design of high-quality learning experiences. Responding to these questions will also serve to create a more complete map, or more coherent and theorised understanding of learning in natural history institutions. Put differently, the research agenda is intended to serve as a tool to better understand what museums do and how audiences learn in and from natural history settings, as a means of improving practice. The agenda is not intended as a way of helping to 'prove' the value or the impact of natural history museums. Rather, it is intended as a resource to guide the field – practitioners, researchers and policy-makers – to a deeper understanding of learning in these settings and to improved practice, although such advances in understanding and practice would certainly form a more robust evidence base for arguments around the value of natural history settings.

Reaching such an end and implementing the learning research agenda in individual institutions requires support from senior management and a commitment to a cultural change, ultimately leading to a fully research-engaged museum. Such an institution would not only draw on research findings for decision-making and innovating practice, it would also contribute to the research base helping to grow the field's experience and wisdom systematically. Such growth, supported by a shared language and goals as envisaged by the research agenda, has the potential to be transformative for the field, better positioning natural history museums in the UK and internationally to leverage our resources to address the wicked problems we face.

i Clark, N. (2013). Gallery and museum attendance up despite decrease in arts participation. *The Independent*. Available at: www.independent.co.uk/arts-entertainment/art/news/gallery-and-museum-attendance-up-despite-decrease-in-arts-participation-9001314.html, accessed December 2014.

ii 'Wicked problems' are sociocultural problems that are often interconnected, involve large numbers of people and opinions, have economic implications and are often defined by contradictory knowledge. As a result, action is focused on improving a situation rather than solving the problem.

iii For example, Diamond, J., Evans, E. M., Spiegel, A. N., Gram, W., Frazier, B. N., Tare, M., & Thompson, S. (2010). A conceptual guide to natural history museum visitors' understanding of evolution. *Journal of Research in Science Teaching*, 47(3), pp.326-353.

iv For example, Palmquist, S., & Crowley, K. (2007). From teachers to testers: how parents talk to novice and expert children in a natural history museum. *Science Education*, 91(5), pp.783-804.

v For example, Bamberger, Y., & Tal, T. (2009). The learning environment of natural history museums: multiple ways to capture students' views. *Learning Environments Research*, 12(2), pp.115-129.

vi Lloyd, R., Neilson, R., King, S. & Dyball, M. (2012). *Review of Informal Science Learning*. London: Wellcome Trust.

vii Falk, J.H., Osborne, J., Dierking, L.D., Dawson, E., Wenger, M. & Wong, B. (2012). *Analysing the UK Science Education Community: The Contribution of Informal Providers*. London: Wellcome Trust.

viii The term 'museum' is used to refer to settings with natural history collections including natural history museums, zoos, botanical gardens, university museums and aquariums.