Critical Review of Conservation Education and Engagement Practices in European Zoos and Aquaria

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Executive Summary

This report begins by providing a brief review of the literature on zoos’ educational impacts. It then presents a critical meta-analysis of unpublished zoo visitor evaluations, subjecting these unpublished report to critical scrutiny in order to identify what value they hold for zoo educators and the zoo visitor studies literature.

Finally, the majority of this report focuses on the results of a critical analysis of patterns and case studies of conservation education-related visitor communication in general and interpretation in particular within European zoos and aquaria. The results of this analysis are documented primarily through photographs taken on-site at multiple zoos and aquaria from 2010-2012. The analysis draws upon principles of best practice demonstrated by research and theory in the fields of visitor studies, communication, psychology, sociology and science and technology studies. This report concludes that there are a range of ‘primary’ or ‘first order’ issues involved in conservation education within zoo and aquarium settings, which must be addressed in order to engage visitors and hold their attention at a basic level. At this basic level, the aim is to ensure that visitors see live animals and are afforded the opportunity to learn about those animals and wildlife conservation issues. At this level, there are key issues relating to, for example, animal visibility and the design of informational signage.

Once a foundation of good practice in first order zoo-based conservation education and engagement is established, there are issues at the ‘second order’ level centred on the precise ways in which pro-conservation messages are crafted and delivered. Also at this second level are issues about which media and approaches are most effective at fostering zoo-based public engagement with wildlife conservation.

The themes identified underneath these two general categories of ‘first’ and ‘second’ order engagement issues are briefly summarised below:

Results: First Order Issues in Zoo-based Conservation Education and Engagement

This critical review of zoo and aquaria conservation messaging identified a basic level of engagement required to set the foundations for effectively engaging visitors with wildlife conservation to foster positive development in attitudes and behaviour. In this report, this foundational level of engagement is labelled ‘first order’.

Animal Visibility as a Precursor to Zoo-based Conservation Education

Visibility is an obvious but important pre-requisite to using live animals to inspire interest and commitment to pro-conservation aims. If visitors are unable to see live animals during their zoo visit, then those animals’ affective impact will likewise not be felt. Whilst there are good reasons for limiting animal visibility in some cases in the interest of animal welfare, zoos must consider ways in which they can maximise visitors’ ability to see animals within the bounds of these welfare concerns. Moreover, animal species that cannot be kept visible for visitors may need to be excluded from
zoos’ collections unless they are serving a purely conservation-oriented function (e.g. involved in a breeding programme).

This section identifies two problematic patterns within the context of animal visibility and one positive direction for zoos to consider in order to enhance this fundamental precursor to zoo-based conservation education. Firstly, there is a tendency amongst a substantial proportion of European zoos to restrict visibility and viewing area size unnecessarily. Secondly, there are sometimes visual obstructions or impediments within enclosures, which inhibit animal viewing. Mitigating these issues within the bounds of animal welfare is an important first order step for unlocking live animals’ contribution to conservation education and engagement. Ways of managing problems with low animal visibility from an educational and engagement perspective are identified, including the use of ‘integral’ (additional, usually smaller) species within an exhibit focused around less visible, more charismatic species to ensure that visitors do not walk away empty handed from an investment of time and attention in trying to see live animals within a zoo setting.

**Visibility and Availability of Interpretation**

Following a similar logic to animal visibility, it is important to note that at a very basic level, informational signs are only useful if they are visible. In a minority of zoos and aquaria assessed during this study, signs were not properly lit, thereby making it nearly impossible to read the content on them. When lighting is available, it is important to consider which method will be most appropriate and effective and drawing visitor interest. For example, there was some evidence in prior research conducted by the author this report at ZSL London Zoo that backlit signs in darkened areas are more effective and drawing interest from visitors than front lit ones.

Another recurring issue in this domain is the physical placement of signs. When zoos try to communicate extended informational messages about conservation, they often end up providing a battery of signs in areas apart from the animals- often directly opposite animal viewing areas. Unsurprisingly visitors very rarely go out of their way to look at these signs, which may be perceived as intimidating given they are filled with text. Moreover, the use of small font raises the effort level required by visitors in order to take in this message.

There is no reason to believe that a fixed sign is an effective medium for delivering such large amounts of text-based information, particularly within a non-formal setting. The more realistic approach to the use of such signs is to focus on communicating clear core ideas with small amounts of text to elaborate in certain key areas, and extensive use of vivid imagery. Panels over-filled with text should be replaced with informational leaflets, which visitors can take away with them and read when it is convenient (e.g. when they can sit down). Information panels around the zoo should focus on providing just the information necessary to guide the interpretation of the animal viewing experience and direct it towards the desired pro-conservation actions. For example,
further details about particular projects that the zoo is involved in can be provided through leaflets, text message (SMS) or the web upon request.

Need for Visitor-Centred Design of Viewing Areas

The viewing areas sometimes include unnecessary deterrents to the free viewing of the animals by visitors of all ages. However, it is particularly important for viewing areas to be made in such a way that children can see the animals without having to climb up fences or lifted onto objects by their parents. Moreover, the visual aspects of ensuring handicap accessibility should also be taken into consideration.

Managing Visitor Flows

As a precursor to conservation education and engagement, visitors need to be able to find their way around the zoo or aquarium. To optimise their experience and the range of both live animals and engagement materials they encounter during their visit, it is particularly important that sufficiently clear and plentiful guidance is offered for visitors to ensure that they make their way through the entire zoo. Without such guidance, many visitors will be unaware of parts of the zoo that they could have seen, thus making that aspect of the zoo’s resource investment in their animal collection and conservation education ineffective per se. In some cases the quantity, quality and clarity of signs meant to guide visitors around the zoos assessed in this study was insufficient for ensuring that visitors had the kind of guidance, cues and suggested directions needed to facilitate their engagement with all parts of the zoo.

Unrealistic Expectations of Visitors

Some of the expectations placed on visitors by the zoos assessed in this study, regarding assumed interest in reading extensive text panels and behavioural instructions are not realistic for a non-formal setting such as a zoo. For example, it is not reasonable to expect zoo visitors to stop and read a lengthy list of rules before they enter an aviary or other exhibit, much less to obey them. Rather, pathways and viewing areas should be designed so that visitor flows are managed without the need for explicit instruction and conscious visitor compliance.

Distracting Elements in Zoo Interpretation

In order for pro-conservation and scientific messages to reach visitors and hold their attention, one pre-requisite is to avoid psychological ‘noise’ that might distract from these messages. One source of possible distractions in many European zoos is the unnecessary elements have been included within enclosures or the surrounding themed areas such as ‘Africa’ as cultural symbols to indicate the geographical region being represented. However, the precise cultural symbols and cues that have been given in many zoos are confusing and difficult to interpret.
Whilst immersive enclosures with plentiful visual cues (typically, plants) regarding the displayed animals’ natural habitats can be effective at subtly imparting conservation learning for visitors regarding the link between animals and their natural habitats (Jensen 2010), some of the zoos assessed present animals within stark enclosures with limited vegetation. This bare form of enclosure design may undermine the conceptual link that zoos are trying to establish between the animals in the zoo and their wild counterparts in habitats often far away and under threat.

The inclusion of such obviously artificial and human elements within enclosures militates against the benefits of naturalistic and immersive enclosure design—raising the risk of negative learning.

Puns and Playful Phrasing ........................................................................................................................................

There is a recurring pattern in zoo interpretation of using puns, allusions and metaphors, particularly in the headlines of signage and in the naming of exhibits. While there is nothing inherently wrong with employing playful language or puns within zoo interpretation, it is clear from the present study that these elements are often included without thinking through the implications for visitors’ interpretations.

Enclosures and Exhibits. At a general level, the naming of enclosures and exhibits should clearly communicate to the visitor the animals they can expect to see. This is important both for managing visitors’ expectations and for helping to cement in visitors’ memories the species they have seen during their zoo visit. Thus, names of exhibits that employ creative or unfamiliar titles without a subtitle to clarify the intended meaning introduce the risk of confusing visitors and distracting them from potential educational impacts. For example, the orangutan exhibit in Chester Zoo is entitled ‘The Realm of the Red Ape’. Given that ‘red ape’ is not a well-known moniker for orang-utans, this label seems to introduce a distracting new name for this species with no obvious pedagogical justification. There is no evident benefit to this distracting exhibit name. Yet it unnecessarily introduces the possibility of confusing visitors and/or distracting them from a clear understanding of what species they have seen.

Other possible examples of this pattern include the Durrell Wildlife Park exhibit names such as ‘Jewels of the Forest’ (aviary), ‘Cloud Forest’ (features Andean bears, otters, coatis and Rodrigues fruit bats) and ‘Kirindy Forest’ (features lemurs and a second aviary). These ‘zone’ titles would seem to reflect the institution’s perception of the coherence of these zones much more than a priori visitor knowledge about what animals they might expect to encounter in these areas. In the case of ‘Jewels of the Forest’, the fact that this phrase is taken from the founder Gerald Durrell’s writing offers a potentially compelling metaphor for the birds that appear in this aviary. However, this phrase may be more appropriate as a component of the aviary’s interpretation than as a standalone description of the zone, which visitors are unlikely to decipher in advance. The unfortunate implication of this naming practice may be under-utilization of these zones.
Signage and Interpretation. At the level of individual information panels, the use of puns and playful language should also be assessed for its connotations and implications. The use of expressions which foster problematic entailments if one thinks through their connotations and implications is widespread within the zoos assessed for this critical review.

Second Order Issues in Zoo-based Conservation Education and Engagement

Delivering messages about conservation issues in a clear and relevant manner is vital for zoos seeking to go beyond the fundamental level of making scientific and conservation information available (first order) to actually engage visitors with key conservation issues and what they can do about these issues as consumers, voters and citizens (second order). Despite the importance of developing such engagement with visitors, only a minority of European zoos appear to go beyond merely providing information to advise visitors that there are actions they can take to help stem the tide of wildlife extinctions.

Empowering Visitors to take Action for Conservation

This section begins by identifying some examples of interpretation that directly address visitors to invite them to join the struggle to save wildlife through increased sustainability. Directly offering visitors suggestions in this manner is a vital component of building towards the most ambitious of zoo claims about their ability to reach visitors and change both attitudes and behaviour relating to conservation. The following is an example of good practice because it begins by clearly emphasising the core message that the individual visitor can ‘do something’ to make a difference, followed by specific suggestions of what they can do.
Despite its strengths, the information panel pictured above also has a few limitations. The first issue is that it only focuses on ‘wherever you are on holiday’ (assuming such a holiday will be overseas presumably given the suggestions offered). This suggests that there should be two separate panels for ‘whenever you are on holiday overseas’ and ‘when you are at home’. This is particularly important as a substantial percentage of visitors to this zoo may never go on overseas holidays.

Another important limitation to note is the vague recommendation at the bottom of the sign to report suspicious activities to ‘the authorities or to a local conservation organisation like SOCP’. The first part of this suggestion leaves the visitor unaware of who precisely to contact, therefore providing a single website of a conservation organisation that collects such reports might be more helpful. Secondly, the acronym ‘SOCP’ is provided without spelling out what these initials stand for. This is inherently problematic as it assumes a very high level of existing conservation organisation knowledge of the visitor. In essence, the advice offered to the visitor should offer clear, concise and realistic advice for actions that he or she can undertake to contribute to wildlife conservation goals.

Managing Polysemy in Object-based Learning and Engagement

Visual imagery is inherently polysemic. That is, it is subject to multiple possible interpretations. For example, a child seeing a tiger cub or a parrot in a zoo might if left unguided conclude that he or she would very much like such an animal as a pet. This would be a negative outcome, but it is entirely possible without specific guidance aimed at directing the interpretation of the visual experience of seeing these live animals.
Directing the experience can take a number of forms, with the most common across European zoos being the use of fixed signage communicating legally required scientific information about the animal species name, the geographical location of its natural habitat and its endangered or non-endangered status. Some zoos go beyond this required information to elaborate further details about the species, its habitat and/or relevant conservation issues.

**Ambiguous or potentially learning-negative objects** .................................................................

Some artefacts or objects or specimens used to communicate scientific or conservation messages could be seen as particularly open to problematic interpretations if they are received by visitors without any educational intervention. Notably, the use of animal skins and skeletons fall into this category of objects which spark potentially problematic thoughts in visitors’ minds. This issue is particularly salient for children who often assume that an animal has been killed by the zoo if they see these objects.

**Institution-Centric Conservation Messaging and Narratives**

The ways in which conservation messages are communicated requires careful thought and calibration in order to make distant problems in far off places feel relevant to zoo visitors’ lives. Messages by zoos and aquaria which focus exclusively on their own organisation and its conservation action run the risk of disempowering visitors by not acknowledging the role for individuals in contributing to conserving wildlife through daily action. A more effective approach to engaging publics with a given zoo’s conservation efforts is to frame these within a larger spectrum of pro-conservation action, which builds from the level of the individual to coordinated group action to institutions such as zoos acting to focus collective pro-conservation action through careful designed programmes targeted at the most urgent conservation issues.

At its most institution-centric, conservation messaging completely centres on what the institution values and finds to be of interest.

**Alternative Interpretation Approaches**

The conventional fixed sign-based approach to zoo interpretation has been questioned on the basis of the limited usage levels of such signs. As such, other approaches to achieving similar aims of educational provision should be considered. Possibilities in this vein include audio guides, informational leaflets that visitors take away with them, electronic options triggered by text messages or visits to a website, video, touch screens and interpretation that visitors carry with them.

**Problematic Patterns in Fixed Sign-based Zoo Interpretation**

There was a consistent trend in many zoos towards the use of drawings of animals rather than photographs for fixed signs. The use of drawings rather than photographs could be considered a missed opportunity, given that a photograph could offer
additional contextual cues about the kind of habitat in which a given animal lives in the wild.

*Interactive Signs and Activities*

In many zoos an interest in introducing ‘interactive’ signs has resulted in the addition of relatively expensive but simple adaptations to the conventional sign such as the use of ‘flaps’ which raise to reveal an answer. The utility of these ‘interactives’ is questionable, given that they generally are the same as normal fixed sign-based interpretation, but requiring manual manipulation in order to access the information. While it is possible that such an approach could yield better outcomes, no evidence of this currently exists. Observations of children using such ‘interactives’ suggests they do not tend to use them as intended by the zoo educators who created the signs. Overall, there should be a fundamental assessment of what is meant by the term ‘interactive’ and whether simply adding flaps to a conventional sign really constitutes interactivity.

*Invasive Species Messaging*

One of the more complicated conservation issues to explain to visitors is the potentially pernicious role invasive species. The idea that non-native species can come to displace and ultimately drive to extinction native species does require some explanation and finding ways to boil down such an explanation for use in a zoo is a challenge. Below, some examples of attempts to tackle this difficult conservation topic are considered. Ultimately better means of communicating this idea are still needed. One important direction for developing this form of conservation messaging is to emphasise the ways in which this is relevant to visitors, for example, suggesting they try to avoid introducing non-native species. Also, providing an example of an extinction that occurred due to invasive species within the country the zoo is based could be a useful way of communicating this message.

*Potentially Disturbing Conservation Messaging*

The use of graphic violent imagery to confront visitors with problems of hunting and animal products only appears in a minority of zoos and aquaria. However, when used this sort of imagery raises the stakes significantly in terms of increasing the likelihood that the signage will have an emotional impact and also that the sign will be interpreted in problematic ways or will upset visitors without a clear benefit. The use of violent and otherwise potentially distressing imagery in zoo interpretation must be done with careful thought and designed to focus the interpretations that visitors might take from such imagery. As with the use of animal skins and skeletons, the use of such imagery is most advisable when zoo staff are present to answer questions and otherwise provide guidance and context about what is being communicated through such imagery.
Overview and Background

This report comprises a critical review of the ways in which zoos and aquaria in Europe are communicating conservation messages regarding invasive species, endangered species, biodiversity and ecological connectivity to the zoo-going public. The report begins with an introduction to relevant literature. The methods and scope of this critical review are then discussed. The results are then explicated through a framework identifying first and second order aspects of engaging publics with wildlife conservation in zoos and aquaria. This report consists of the following sections:

• An introduction critically reviewing some of the existing literature on engaging publics with wildlife conservation. Essentially, there is very little robust evidence of pro-conservation impacts stemming from zoo-based public engagement. However, there are some relevant examples of research that has been done in this domain, which are reviewed in this section. Other studies are discussed where they are relevant to particular themes within the first and second order engagement framework.

• Thematic case studies each focusing on a particular aspect of zoo-based public engagement, drawing upon documented examples of practice in European zoos and aquaria. These thematic case studies include discussion of intended and possible outcomes from different engagement initiatives, as well as relevant evaluation evidence where available.

Introduction to Conservation Education and Evaluation in Zoos and Aquaria

Article 13 of the UN Convention on Biodiversity clearly articulates the need for greater public learning about wildlife and conservation. It calls on all parties to “promote and encourage understanding of the importance of, and the measures required for, the conservation of biological diversity”. Indeed, greater public understanding and involvement is needed if there is to be any hope in the struggle to curtail the dramatic loss of plant and animal life already underway around the world. While new green technologies and government initiatives can make a difference, public interest and understanding of the science of biodiversity loss is an important factor that must be addressed. The socio-cultural dimensions of this ever-intensifying problem are inextricably linked to public views about the science and values of protecting wildlife habitats from threats (whether climate change-related or not). One set of institutions committed to engaging publics about biodiversity in general, and wildlife in particular, is the world’s accredited zoos. Despite the ethically questionable history of early zoos, contemporary zoos now play a high profile role in wildlife conservation and informal science learning. Moreover, zoos claim to serve a vital educational and engagement role in persuading publics of the importance of biodiversity conservation and involving them in this cause. Yet zoos’ claims about promoting public understanding of biodiversity and wildlife conservation cannot be simply accepted at face value. In order to understand what aspects of zoo visits most effectively develop visitors’ learning and why, rigorous impact evaluation is required.
While the inclusion of some form of conservation message in EU zoos and aquaria is widespread, there is a great deal of variability in the depth and quality of messaging and there are some sites that only present the legally required minimum information about animal species in their collections. Amongst those who do seek to engage their visiting public with wildlife conservation, the approaches adopted are almost entirely idiosyncratic and governed by the individual judgements of those tasked with creating a sign or interactive exhibit. There is very little evidence of sharing of good practice or of messaging strategies across sites, despite the clear potential for efficiency savings by doing so. Moreover, there is no evidence of formative evaluation or public engagement guiding the design of any conservation messaging in the zoos and aquaria assessed for this research. Most surprisingly, despite the high priority given to conservation education in the institutional and sector-wide discourse of zoos and aquaria, there is no robust research showing the impact of different approaches to engaging publics with a conservation message on key visitor outcomes such as attitudes, behavioural intentions and actual conservation behaviour before and after a zoo visit. There is some robust evidence of factors influencing externally visible visitor behaviour within the zoo itself, which is adduced within the body of the analysis presented in the results below. However, the lack of quality evaluation evidence (either published or unpublished) necessitates a primary analytic approach. As such, this study draws on original visual data collected showing different communication approaches across European zoos. These visual data are then analysed drawing upon social scientific theory and research to critically evaluate their face validity as interventions designed to engage visitors with wildlife conservation.
Evaluation Meta-Analysis

In order to gain insights into the effectiveness of particular educational interventions by zoos and aquaria, rigorous evaluation is required. This section provides detailed critical analysis of a selection of prior literature relevant to conservation education practice. The section begins with a critical review of published literature, then assesses unpublished ‘grey’ literature.

Published Zoo and Aquarium Evaluation Literature

This review begins with studies of the effectiveness of zoo-based education and public engagement where the outcome measures are based on observations of externally visible behaviour and then considers a range of studies that have employed different methods to answer questions about the nature of visitors’ zoo experiences and outcomes.

There have been a number of internal evaluations conducted by zoos or commissioned consultancies to assess the efficacy of specific zoo enclosures or zoo-based engagement activities. However, relatively few of these evaluations have reached a standard suitable for publication in peer-reviewed journals. Within the academic domain, there is a sprawling, if relatively sparse, empirical literature on zoos’ impacts focused on a wide range of variables. In this section, we critically review the findings of some of the more robust studies, which address variables relevant to the present research (viz., perceptions of zoos and conservation). Prior published research on zoos often eschews fundamental questions about zoos’ ability to deliver effective science and conservation education, instead focusing on dependent (outcome) variables such as satisfaction, ‘stopping power’ (amount of time stopped in one place) and ‘implicit connectedness to nature’ which are assumed to provide some proxy information about educational impact. Previous studies have focused on independent (causal) variables such as viewing area size (e.g. Moss, Francis, & Esson, 2008), the relative credibility of different zoo-based personnel (e.g. Fraser et al., 2008) and ‘identity-related motivations’ (Falk et al., 2007). Amongst those previous published studies that do focus on zoo impacts, most use post-visit only or aggregate-only data (or both), thus making it impossible to identify patterns of conceptual development that can be validly applied at the level of the individual (Molenaar, 2004). Indeed, a range of methodological shortcomings such as an over-reliance on retrospective and prospective self-report data further undermine the conclusions of most such studies of zoos’ pro-conservation impacts.

Indirect and Preliminary Measurement of Impacts of Zoo-Based Conservation Education

Studies at Chester Zoo have attempted to address zoo impacts using only measures of externally visible behaviour. Moss et al. (2010) investigated the impact of a public talks programme at the Chester Zoo. Data collection for this project involved the use of unobtrusive video recording. Video recordings were used with the aim of gathering a more complete picture of visitor behaviour within a zoo setting than could be achieved with traditional pen and paper methods. Ethical issues were managed by ensuring that
the public was well aware of the possibility of being recorded in the keeper talk areas, through the display of signage describing the research activities and warnings of live recording. Six talks were selected and recorded over a period of six days. Video recordings were collected just prior to, during, and after the presentations. Two cameras were established a front-view and back-view camera as a way to capture the behaviours of the entire audience. This method did allow for a more complete picture of the audience to be formed and be more critically analyzed. Using the front-view recordings, the number of attending visitors was recorded, as was their attentiveness. Using the rear-view recordings, row densities and attentiveness of individuals were recorded. The basic results show that as visitors were able to situate themselves near the front of the talk their attentiveness also is increased. This study also indicates that the public talks are beneficial in increasing attentiveness at the individual exhibits. If the appearance of visitor attentiveness is used as an indicator of visitor’s potential to learn, as suggested, the research shows that interactive animal elements are a good indicator of increased visitor attentiveness. In spite of these claims, visitor attentiveness cannot be attributed to learning without a cross-validating measurement tool, such as questionnaires or interviews.

Further research conducted at Chester Zoo evaluated visitor interest in 40 different zoo species by taxonomy to inform collection planning and the selection of zoo animals for educational purposes (Moss & Esson, 2010). The aim of the research was to investigate the predictors of popularity amongst a range of zoo-based animal species, highlighting the implications of these findings for contemporary zoos’ education missions and collection planning. Visitor interest in animals was measured by two main outcome variables: attracting power (number of times visitors stop) and holding time (how long the visitors stopped for). Possible predictor variables that were investigated included the objective characteristics of the animal, level of animal activity and the proximity of the visitor to the animal. Proximity was studied by distance, but not relative to the enclosure barrier. Visitors were not aware of the nature of the study, unless they approached the researchers. Observations were recorded only when the animal in the selected exhibit was clearly visible. The most significant predictor of visitor interests were taxonomic groups, with mammals being the most captivating and birds being the least. Within these groupings, categories such as animal activity, size, and whether the animal was a “flagship” species changed the attraction between each species. Conclusions of the study expressed that further research needs to be conducted to determine the correlation between visitor interest and learning. One idea that Moss & Esson recommend that in the future “that species should only be assigned the collection role of ‘education’ if they can provoke a certain ‘minimum’ interest level in visitors” (pg. 727). However, due to the nature of museums this method may have construed the data.

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1 Note: This procedure of only including cases when the animal was visible is understandable, however it does raise the possibility of a validity problem in the measurement of visitor interest in the animal. This is
as observations of individuals who were held at an exhibit in search of a species was not included. Such species as birds and reptiles often seek concealment within their enclosures and if the advice of Moss and Esson were to strictly be upheld these species would not be considered as a species of interest.

In a similar visitor tracking study, Povey and Rios (2002) researched the interactions of visitors to determine the relative effectiveness of zoo programmes. The study focused on zoo visitors who partook in traditional zoo exhibits and those visitors partook in interactive educational presentations in an exhibit that contained the same species. Interpretive presentations consisted of removing the animal from its exhibit and presenting it to visitors in spontaneous presentations. Each exhibit was independently evaluated through observations and surveying. Random sampling methods were used, in each exhibit, to select every fifth adult visitor as a potential participant. Visitors were could be selected to partake in one component of the study, either the traditional exhibit or interactive exhibit, but not both. Once the visitor agreed to partake in the exhibit the participant was observed during their visit and then asked to fill out an exit survey at the conclusion of their time within the exhibit. The survey aimed to collect visitor demographic variables and beliefs the visitor held on the selected species. Observations of the selected participant were recorded throughout the duration of their visit within the exhibit. The information recorded included: what type of information visitors sought from the educators, how many questions they asked during their visit, and how visitors used the space (tracked and timed). Fifty-seven exhibit visitors and 55 interpretive presentation visitors participated in the study. Overall, visitors spent approximately 55 seconds in the selected traditional exhibit and 185 seconds viewing the interpretive exhibit. Twenty-five percent of the exhibit visitors read at least one of the text panels and 45 percent of visitors asked interpretation presenters a question. Survey results were used to indicate that visitors to the interpretive presentations held higher positive feelings about the animal’s care and quality of life than those who visited the traditional exhibit. From their results, Povey and Rios (2002) claim that the best mode of educational delivery is for interpretive animal presentations with live animals outside of their enclosure. One critical error in these results surfaces from the lack of pre-visit survey results. Without the comparison of the prior state of the visitor, it is unrealistic to assume that visitor feedback is directly correlated to the one experience. This is particularly true, as participants may have had the opportunity to partake in both experiences or exclude themselves from either experience due to preconceived attitudes. Methods for this study need to be improved to claim such findings, including the consideration of all factors (proximity to animals, availability of staff, interactive components). However, what can be taken from this study is the information on visitor timing in interpretive exhibits. Visitors spend longer in interactive exhibits, giving zoos a greater opportunity to study and improve the visitor experience. The results of this study could be utilised as a starting point to determine if animal proximity and interaction is a key factor for change in visitor attitudes and behaviour.
Research conducted at the Lincoln Park Zoo in Chicago focused on visitor expectations regarding zoo exhibitions (Ross & Gillespie, 2009). The researchers cited a need for this kind of study due to previous research that indicated zoo visitors’ needs included recreation and entertainment. Researchers conducted the study to understand how to meet the entertainment needs of visitors, while still providing them with an educational and preferable pro-conservation experience. The objectives of the study were to understand how to characterize visitor behaviour in a contemporary, immersive zoo exhibit; identify key demographic variable that may influence visitor behaviour; and to use these data to identify successful elements within the facility. Observation (i.e. visitor tracking) was used as the method of evaluation. Observations of 338 visitors were conducted by following every third visitor through the door of the Lincoln Park Zoo’s interactive exhibit, African Journey during the months of September through November 2003. Visitors were excluded if they could not move of their own free will or were under the age of three. The exhibit included very traditional zoo exhibits, animal identification panels, text panels on African culture, interpretive elements, and other natural habitat conditions. Visitor behaviours recorded included: dwell time, time interacting with zoo personal, demographics, ‘engagement’ with exhibit or graphic, events, and states. ‘Engagement’ was defined in this study as the visitor being within 6ft of the exhibit or graphic, stopping for more than 2 seconds, and facing the exhibit or graphic. The ‘attraction power’ of each exhibit or graphic was determined by dividing the number of visitors engaged by the total number observed visitors. The results of the study indicated that of the participants observed, the most ‘engaging’ elements of the exhibit included the large animal displays (crocodile and hippopotamus) and educational, interactive exhibits. Results indicated that as long as the educational aspects of the exhibit were located away from animal exhibits, they kept visitors engaged. Ross and Gillespie (2009) discussed that only the most interactive exhibits provided high levels of visitor engagement and attracted the largest numbers visitors. Interestingly, the research illustrates that those visitors who interacted with other visitors or zoo staff spent significantly less time reading signage. Indeed, this finding highlights one of the limitations of relying only upon externally visible visitor behaviour to evaluate exhibitions, as other studies (e.g. Jensen, 2010) have shown that interaction with other visitors and staff can yield better engagement outcomes. Despite the limitations of using the visitor’s outwardly expressed behaviours as an indicator of engagement, the observations do provide evidence of what components of an exhibit encourage the highest level of visitor engagement. Knowledge the most engaging components of an exhibit assist in the development and design of new exhibits.

**Direct Measures of Visitor Participation**

There are research studies that focus on the needs or visitors and the way in which visitors participate in the exhibit. Fraser et al (2009) conducted the first research with visitors evaluating visitor preference for the type of content and information that is made available on the animal identification labels on zoo exhibits. Fraser et al. identify animal identification labels as one of the most important pieces of animal
communication in zoos but question whether the identification labels meet the needs of the visitor. To answer this question, three zoos and two aquariums undertook a collaborative research study exploring visitor preference for content of animal identification labels. The study consisted of two surveys, an open-ended and close-ended survey. Prior to the design of the surveys researchers divided the animals into categories such as “big cats” which would include lions, tigers, and other large felids. Surveys collected the opinions of visitors on animal identification labels on eleven different categories of animals and were administered near the animal category being surveyed. The close-ended instrument was designed as a preprinted card with a list of 19 categorising of information that may appear on an identification label. Participants were conveniently selected from the adult visitors, ensuring that the sample was “represent[ative] cross section of typical visitors to each zoo or aquarium” (pg. 13). Visitors were asked to verbally identify 3 of the categories on the card that they would prefer to see on an identification label These categories were determined through antidotal evidence of visitor interest by zoo educators, staff, and exhibit designers. The second survey was designed as an open-ended survey to confirm the researchers choice of the 19 close-ended information types. Again, visitors were asked to identify 3 items they would like to appear on identification labels; however, at this stage they were asked to do so without a prompt. Results from the study indicate that visitors preferred that identification labels include “odd facts or behaviours, endangered status, and where an animal can be found living in the wild” (pg. 17). Results from the open-ended survey confirmed the choices that were made in the closed-ended survey. Fraser et al use their results to establish that “exhibit developers would be well served if they undertake quick front-end [evaluation] of their visiting public to determine what basic questions they want answered about an animal to be displayed” (pg. 17). This is a proposition that, if employed, would be a useful prerequisite to the development of any type of exhibit. Fraser et al has provided the framework for front-end evaluation that could be employed by all exhibit developers in the development of their exhibitions. However, what Fraser fails to reference is the need to follow-up the front-end evaluation with a series of follow-up formative evaluations. Without the critical follow-up evaluations, it is difficult to ascertain if visitors are satisfied with the information that is available on identification labels and what impact this has influencing the number of visitors who read the identification labels. Additionally, the selected sampling method cannot guarantee the results best represent the views of the visiting population. Researchers cannot be sure that selection bias, through convenient sampling, did not unconsciously bias their results. Researchers may have inadvertently selected those individuals who are most likely to produce the answers that would be expected in this study, as they may be those individuals who staff normally interacts with in discussion. To produce genuine results the evaluator should follow a random sampling method that includes a majority of visitors, including children. This research does provide direction for simple public participation in the development of interpretation in zoo exhibits, where public ideas and opinions can be employed for the good of the public.
**Direct Measures of Visitor Outcomes**

Bruni et al. (2008) sought to determine if visiting zoos had a measurable impact on the visitors’ relationship (implicit and explicit) with nature and to test the effects of zoo settings on this relationship. Three urban New York City zoos participated in the study: Prospect Park, Bronx, and the Central Park Zoo. The hypothesis of this study stated that spending time in a zoo would result in an increase in implicit connectedness with nature but explicit connectedness with nature would largely be unchanged. To measure the explicit connectedness with nature the ‘Inclusion of Nature in Self Scale’ was used in which visitors ranked their self on a graphical scale. The graphical scale depicted how they saw themselves interconnecting with nature. This scale is drawn with two circles, one labeled self and the other labeled nature. Visitors are asked to identify to what degree they see themselves as overlapping with nature – as each graphic has the two circles overlapping each other. No overlapping receives a score of 1 and completely overlapping receives a score of 7. These scales do not offer a description of what nature is or what is means to be ‘connected to nature’. It is at the discretion of the visitor to determine what nature is and what it may mean to be fully interconnected with nature. Therefore, the reliability of this measure may be limited by the fact that its ambiguity is likely to attract divergent individualized scales from each respondent rather than inter-subjective attitudinal measurement. Implicit connectedness with nature was measured with a game, FlexiTwins, an implicit association test in which visitors were asked to sort ‘nature’ or ‘built’ words into a self-identification category or another category. The game is displayed as two frogs on a natural background. Participants played the game three times. The first two rounds had the participant sort words into the categories ‘me’ or ‘other’. During the third round participants sorted words in either a ‘me or nature’ category or a ‘other or build’ category. Through this manipulation visitors were expected to show implicit changes in their connectedness with nature from their zoo visit. The graphical backdrop of the game and the final round could both be suggestions for individuals to choose the ‘right’ words and avoid the ‘wrong’ words, where participants may feel unconsciously obligated to choose the natural words. Participants for the research were obtained by simple convenience sampling at two of the facilities (Prospect Park (n = 42) and Central Park Zoo (n = 49) and by random sampling at the third facility (Bronx Zoo (n = 151). Differences between facilities in the final statistical analysis were not significant. The statistics suggest that implicit connectedness with nature can be improved through a visit at one of these zoos. The results also suggest that traditional, non-immersion exhibits achieve the same results as immersive exhibits (Bruni, et al., 2008).

Clayton et al. (2009) investigated the interactions of animals and visitors to understand if such interactions improved the visitors’ conservation-related attitudes and behaviours. The first component of research examined the relationship between the visitors’ zoo experience and conservation-related outcomes. At the Cleveland
Metroparks Zoo, 206 visitors were surveyed. The survey consisted of general reasons visitors had come to the zoo and their perception of animals that were held. The perception questions focused on descriptions of animals, feelings, and attitudinal questions. Participants were selected using a convenience sampling method in which every visitor was to be asked. As well, families with numerous children (more children than adults) were excluded from partaking. Not only does this introduce a large bias into the survey methods but the data may also be skewed, as it left out one of largest zoo visitor groups. This research claims that zoo visits were positive family experiences with education as a secondary outcome. However, statistical analysis may be skewed as a majority of families may not have been included. The second component of the article was based on a multi-institutional study examining how viewing animals affected the construction of the visitors’ conversation. Questions for this study centered around: to what extent do visitors respond to their animal exhibit experiences as a learning opportunity, how do visitors use animals to facilitate social interactions, and do visitors make verbalizations that reflect an enhance sense of connection or similarity to the animal being observed? The study observed several exhibits at each of the three participating facilities in which the observer could be unobtrusive to the visitors’ experience. Visitors were conveniently sampled as they crossed an imaginary boundary, as they left the next visitor who crossed the bound was observed. Observers noted the dwell time, background characteristics, whether or not the visitor appeared to read signage, and the category of visitors’ responses to the exhibits. Visitor responses were categorized and recorded as emotional, social, connecting with the animal, and an indication of future conservation attempts. No survey was used in the attempt to collect this information. From the observations, the researchers concluded that zoos were to be places of contemplation and not cognitive learning, although they had the capacity to be places of learning. Moreover, the Clayton et al. (2009) argued that zoos can increase positive feelings toward animals and may enhance the visitors’ support for conservation initiatives.

A collaborative study conducted by the Institute for Learning Innovation and Disney’s Animal Kingdom (DAK) concentrated on the abilities of DAK to convey conservation messages to the public through a ‘Conservation Station’ exhibit (Dierking et al., 2004). The objectives were to evaluate how a behaviour change model could be used to document the short- and long-term impact of interpretive messages on visitors in the Conservation Station exhibit. Methods of this study involved the use of the Prochaska Stage Model of Behavioural Change in exploring the continuum of behaviour change in visitor conservation attitudes. DAK broke the changes of behaviour into a five-stage process: Pre-Contemplation, Contemplation, Preparation, Action, and Maintenance. Attitudes and behaviours were surveyed at three different time periods: pre-visit, immediate post-visit, and long-term post-visit. The survey consisted of eleven conservation-related behaviours, ranging from simply spending time in nature to talking to others about conservation awareness. The scale is subjective in which
visitors must gauge their willingness to participate or current participation in each of the behaviours, but does not specifically outline the details of such behaviours. This could lead visitors to make abstract judgments on what ‘nature’ entails or could lead to inflation of visitor behaviour. Without the specificity of behaviour, for example how often one volunteers or participates in said behaviour, it is impossible to know if the visitor is truly a part of the Pre-Contemplation stage or the Action stage. Some researchers believe that each stage could be further broken down into several sub-stages. There are multiple variables that compose a continuum in each stage and individuals within each stage may be on any position along that continuum (Dierking, et al., 2004). A total of 300 visitors participated in the pre-visit survey, 302 in the exit survey, 100 visitors participated in both the pre- and post-visit survey of, and 72 in the long-term interview (2-3 months later). Participants were selected as every 7th adult guest who crossed an imaginary line outside of the exhibit. Long-term participants were randomly selected from the pre- only and pre-/post- respondents. Long-term selection was limited to only 100 participants, in which only 73 took part. A majority of visitors classified themselves as in the Preparation stage, as they were already moderately too highly interested in becoming involved in conservation-related activities. Immediate post-visit surveys demonstrated a significant increase in conservation interests; however, no significant changes were observed between the pre-visit and the long-term post-visit survey. The most change occurred in those individuals who identified as Contemplators. Although, most changes in behaviour were not well pronounced and this may be due to the lack of clarity on what the stage involves, as behaviours may be greatly variable within each of the stages. A second form of evaluation may be more appropriate to determine more sensitive changes in stage. Dierking (2004) conclude that most conservation education concentrates on Pre-Contemplation and Contemplation information rather than providing action information for visitor use.

Visscher et al. (2009) studied the relative knowledge gain of fifth grade students (ages 10-11) after viewing an animal training session under two conditions. Students took part in either a fact-only presentation, in which facts of animal training were presented; or students partook in an interpretive animal training session, in which a narrative was presented to students describing how “training helps the zoo take better care of its rhinos”. In the interpretive session the trainer asked questions of the students, allowed students to hear and touch the training tools, and encouraged the students to ask questions. Students were not able to ask questions, touch, or be involved in any way during the fact-only presentation. A third class of students were left as a control group, in which they did not participation with the trainer and only

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2 Thus only 1/3rd of the pre-/post-samples offered a valid measure of possible impact. Unfortunately as all the data were combined in the reporting of results, it is impossible to disentangle the valid from the invalid data comparing pre- and post-visit survey data.
watched the training session. All student groups were administered a 'knowledge quiz'. Questions focused on the training of rhinos and training in general. The quiz consisted of three open-ended questions in which students were expected to reiterate information perceived from the training session. The mean score was highest for those students who took part in the interpretive presentation, with no significant difference between the fact-only group and the control-group. The study suggests that this ‘knowledge quiz’ is a reliable measure of short-term knowledge gain. Although, students were not given a pre- and post-presentation; therefore, it cannot be assumed that the students scores are directly correlated to this one experience. Students in each test category came from different classes and may have acquired different knowledge from their respective classrooms, as no two classrooms teach the same curriculum (Visscher, et al., 2009). Therefore, for the most accurate results this study should have sought to research the change in knowledge gain from this experience. This research does however suggest that the ways in which information is conveyed does have an impact on what is learned.

Verbeke (2011) aimed to investigate the degree to which conservation education in a zoo can have an impact on visitors’ knowledge, attitudes, and behaviours. Two data collection methods were used: tracking and observing visitor behaviour and a post-visit survey. Variables in the observational study included dwell time in an exhibit, number of visitors reading information panels, and the number of visitors interacting with interactive interpretives. The post-visit survey documented reasons for visiting the zoo, current and past zoo experiences, familiarity with conservation terms, opinions about society's role in addressing seven important conservation issues, and self-reporting the favorite exhibit at the zoo. This study yielded a number of relevant findings. Visitors self-reported reading at least one information panel during their visit significantly more often than they were observed reading such information. Therefore, using self-report data is misleading for visitor research. As exhibit walkway length can affect the visitor’s dwell time, dividing the time spent in an exhibit by the walkway length created the adjusted dwell time. Adjusted dwell spent was not dependent on the number of signs in the exhibit; however adjusted dwell time was significantly longer when more interactives were present. The survey showed that the exhibit which visitors reported, as their favorite exhibit did not correspond with a longer adjusted dwell time at the exhibit. Thus, merely increasing dwell time may not improve visitor satisfaction. Visitors at this Midwestern American zoo indicated familiarity with the conservation terms “endangered species” and “biodiversity” and could provide examples, although not always accurate. Participants were not familiar with the conservation terms, “invasive species” and “ecological connectivity”. Although respondents generally agreed that conservation issues were important worldwide, they often indicated they were not important locally or relevant in their own lives. In fact, respondents often believed that human-made conservation issues were over-rated by the press (Verbeke, 2011). Most respondents recognized that “human-made disasters” and “critical habitat preservation” were important conservation issues. Although this study offers some
indication of one zoo’s visitors’ conservation awareness, the heavy reliance on self-report data to measure visitors’ conservation attitudes introduces likely forms of response bias. In particular, social desirability bias in which respondents say give the socially accepted response rather than an authentic one must be carefully avoided. In this case, social desirability bias may well be inflating visitors’ expressions of conservation concern. Moreover, because this is a post-visit only study, it offers no direct means of measuring impact. Thus more stringent research must be undertaken to gain a more useful picture of Niabi Zoo impact on the visitor population.

Research on the relationship between exposure to different interpretive approaches and zoo visitor outcomes has become a specific focus of visitor study research. Weiler and Smith (2008) conducted a study at the Werribee Open Range Zoo in Melbourne, Australia within the Lions on the Edge (LOTE) exhibit. In this exhibit visitors have the opportunity to experience five different types of interpretive experiences: walk (static displays), talk (keeper talk), volunteer (interact with volunteer guide), actor (interact with role-play characters), and tour (behind-the-scenes, including feeding). The objective of the study was to determine to what extent does exposure to multiple forms of interpretation lead to greater impact. To achieve this, researchers set up an extensive method in which first all involved staff were guided in prioritizing the desired objectives. Second, each of the objectives was assessed on the validity of its achievability. Third, researchers worked with an independent evaluation consultation firm to reduce, refine, and test this validity. The resulting questionnaire sought to: reflect the expectations of the zoo’s outcomes for interpretive programmes, theoretically sound, methodologically sound, and requires minimal time and effort on the part of the visitor. Therefore, this questionnaire is only established to meet the needs of this institution and this exhibit and does not therefore apply in every respect to all zoo exhibits, both internally and externally. This questionnaire also puts a significant amount of weight in the self-report of behaviours, attitudes, and knowledge and therefore may not provide valid measurement of visitor impacts. Participants were chosen as they exited the exhibit using ‘systematic sampling methods’ to minimize sampling bias. No pre-questionnaire was administered nor were participants observed throughout their experiences. The study concluded that multiple layers of interpretation enhanced the perceived impact on the visitor and suggested several layers of self-selected interpretation as one of the more advantageous choices for zoo managers trying to improve impact within their exhibits (Weiler & Smith, 2008).

Sickler and Fraser (2009) studied ‘enjoyment in zoos’ by analyzing 26 participants’ agreement with pre-formulated statements about enjoyable aspects of zoo visits. A ‘consensus statement’ about zoo enjoyment was ranked highly across different visitor types: “I really just get a good feel for just how beautiful all of these animals can be” (Sickler & Fraser, 2009, p. 11). This statement is reported to have the greatest level of agreement from the participants. However, one limitation of this study is that it exclusively uses aggregate statistics at the level of sample means, rather than following single cases. As such, changes occurring at the individual level are left unexamined.
While this is a common practice in quantitative social research, aggregate statistical analysis cannot legitimately claim that findings apply at the level of individual participants (see Molenaar, 2004). Nonetheless, Sickler and Fraser’s (2009) study offers an initial indication that animals may be a major reason why some people find zoos enjoyable.

Turning to environmental attitudes, a study of visitors ($n = 242$) to three New York City zoos investigated ‘connectedness to nature’ as a possible benefit of zoo attendance (Bruni, Fraser, & Schultz, 2008). ‘Connectedness to nature’ was operationalized using two scales: a computerized Implicit Association Test and a Likert scale using concentric circles with increasing overlap between ‘nature’ and ‘self’ (‘Inclusion of Nature in Self’ scale). Bruni et al. (2008) reported a significant link between ‘spending time in a zoo’ and increased score on the ‘Implicit Association Test’, which they call ‘implicit connectedness with nature’. However, this only held true for attendees at one of the three zoos tested (Central Park Zoo, $n = 49$). In addition, no link was found on the second scale ‘Inclusion of Nature in Self’, raising the (unaddressed) issue of why one scale yielded a significant effect and the other did not. Moreover, the study employs the same potentially problematic approach of using aggregate statistics to make claims about the impact of zoos at the level of the individual. Finally, for the study’s largest sub-sample (Bronx Zoo, $n = 151$), the before/after samples were different (independent rather than paired samples). Given these are not reported to be randomly selected probability samples, this procedure undermines the statistical claims made by Bruni et al. about aggregate change from pre-visit to post-visit. As data from this sub-sample were amalgamated with the others, it is not clear that the study’s overall results are reliable. However, this study comes closest to suggesting an indirect link between environmental attitudes and zoo visits.

In another Australian study, Smith et al. (2008) investigated whether a zoo-based educational presentation promoting specific conservation actions had its desired impact. The researchers assessed visitors’ recall of the presentation, the recommended conservation actions and their intentions to follow through on those actions. Respondents were asked to provide self-report data about whether they “recalled hearing” the recommended conservation actions from the presentation (81% said ‘yes’). 59% of these individuals said they already knew of all the actions mentioned in the presentation (only 14% acknowledged not knowing the actions beforehand). While this research would seem to indicate that zoo-based educational presentations are well-remembered by audiences and that zoo audiences are already well-versed in conservation strategies, the results must be interpreted with caution. Because the researchers did not conduct any pre-presentation data collection, their data are subject to a potential bias wherein respondents give answers they believe are socially desirable. If respondents had been asked to list conservation actions both before and after the presentation, it would have been possible to establish that the zoo-based educational presentation was the determining factor in any new knowledge. As this pre-/post-test procedure was not employed however, the variable tested in this research is very much
in doubt. Although far from conclusive given the methodological limitations enumerated above, this study does support the idea that zoo-based educational presentations can have an impact on adult visitors.

Perhaps the most prominent prior study of zoos’ educational impact was conducted by Falk et al. (2007) at four sites in the United States. This zoo visitor study was called the multi-institutional research program or MIRP (Falk, et al., 2007). In this multi-part study, Falk et al. (2007) set out to evaluate adult zoo visitors’ motivations for attending and any changes in attitudes towards or knowledge about conservation. Falk defines this task in terms of ‘identity-related motivations’. The focus on these motivations is justified as a prerequisite for ‘prediction’ of visitor outcomes: “we need to capture the essence of what motivates visitors so we could better predict what they might gain from their visit” (Falk, et al., 2007, p. 6).

Falk’s (2007, p. 9) fundamental thesis is that visitors arrive at museums or zoos with “specific identity-related-motivations and these motivations directly impact how they conduct their visit and what meaning they make from the experience”. He develops this thesis with his audience segmentation approach and refers to visitors as durably belonging to one of his five categories. The five visitor types Falk (2007, p. 13) proposes are; Facilitators (“desire a social experience aimed at the satisfaction of someone else” such as parents), Explorers (“visit for personal interests” such as learning), Experience Seekers (“visit as tourists are value the zoo [...] as part of the community”), Professional/Hobbyists (“are tuned into institutional goals and activities”), Spiritual Pilgrims (attend zoos as “areas for reflection”). However, this entire ‘identity-related motivations’ approach has been called into question recently by a critical essay by Jensen and Dawson (2011). Jensen and Dawson (2011) also challenge the methodological approaches employed in the MIRP study for a range of fundamental errors in assumptions and measurement biases. Complementary critiques have also been published highlighting the basic flaws in Falk’s approach (e.g. Bickford, 2010) and Falk et al.’s (2007) questionable survey methods (Marino, Lilienfeld, Malamud, Nobis, & Broglio, 2010).

The segmentation research conducted by Falk, Fraser and other zoo researchers and indeed most other zoo visitor research in the literature- is almost universally focused on adult visitors only. As recently noted by Fraser (2009), there is a surprising paucity of evaluation research focused on children visiting zoos. Published zoo visitor studies of zoo impacts routinely exclude children from their samples. One example of this is Fraser’s (2009) research on parents’ perspectives on the value of zoo visits conducted at Bronx Zoo in New York City. Interviews and observations of zoo visits were undertaken with eight families (14 adults). The study concluded that “parents conceive of the zoo as a useful tool [...] to promote an altruistic sense of self, and to transfer their environmental values. [...] They could use these visits to actively support their children's self-directed learning” (Fraser, 2009, p. 357). However, the study only discusses parents’ assumptions of the impact of zoos on their children- or what Fraser
calls ‘anticipated utility’. The actual utility of visiting the zoo for these children was not investigated, leaving this issue still unaddressed in the published research literature on zoos.

This lack of direct evidence of the value of zoo-based education prompted a study focused on educational outcomes conducted at London Zoo. Arguably the strongest evidence of positive educational outcomes from zoo visits is this mixed methods study of outcomes for children and young people conducted by Dr Eric Jensen (co-PI). This was the largest ever \( n = 3018 \) empirical study of the educational impact of zoo visits for children and adolescents worldwide. Using mixed methods survey research, the evaluation study demonstrated the significant positive impact that visits to London Zoo can have on outcomes including understanding of animals, habitats, environmental threats, and conservation-related learning. Indeed, 53\% \( n=1427 \) of post-visit survey respondents evinced a positive development in at least one area pertaining to zoos’ engagement and conservation functions, understanding of animals and their habitats, personal concern for endangered species and empowerment to participate in conservation efforts (Jensen 2010).

Moreover, Wagoner and Jensen (2010) found that zoo education was capable of transforming the biodiversity and conservation-related thinking of children visiting the zoo. However, this impact was mediated by the cultural, religious and ethnic backgrounds of the children under study. As such, this study highlights the importance of cultural context comprising the background assumptions for zoo visitors.

**Critical Meta-Analysis of Externally Commissioned Zoo Evaluations**

One component of this project involved the distribution of a request for evaluations that zoos and aquaria across Europe have conducted. This ‘call for evaluations’ was distributed through lists to both the British and European zoo associations, as well as being issued at major European zoo conferences. The number of evaluations that were collected as a result of this was very limited. Two zoos in the UK accounted for most of the evaluation work that had been done, with one zoo tending to commission external consultancy firms to do summative evaluation of their exhibits. In addition, one unpublished evaluation from a US aquarium was also obtained. These evaluations are critically evaluated in this section to identify whether there are any useful findings that can be gleaned in light of any methodological limitations they might have.

In this section, two externally commissioned summative evaluations are critically assessed for their methodological rigour and therefore the lessons that can be securely gleaned from them. The review shows that these evaluations, which are representative of the ‘industry standard’ in zoo and museum evaluation, are highly flawed and therefore the results offer limited reliable insights. Both evaluations were conducted by leading museum consultancy Morris Hargreaves McIntyre.
‘A zoo within a zoo’: Evaluation of Animal Adventure (London Zoo)

The first evaluation focuses on the newly refurbished children’s zoo ‘Animal Adventure’ within ZSL London Zoo (Morris Hargreaves McIntyre, 2009b). It is claimed that this study will monitor the impact of the refurbishment by evaluating current visitor patterns in the Animal Adventure area and comparing them to data collected by this company in a pre-refurbishment evaluation.

Data collection for this evaluation is described as follows:

Two focus groups with families, 98 exit surveys (28 August to 4 September 2009) with families visiting Animal Adventure, 35 depth interviews with children exploring what they liked best and what they would improve. (Morris Hargreaves McIntyre, 2009b, p. 5)

The evaluation report makes both qualitative and quantitative claims and generalisations on the basis of this small data set, with the ‘key findings’ summarised as follows:

In the short time it’s been open, Animal Adventure has already begun to drive visits to London Zoo with 12% of visitors saying that it influenced their decision to visit. Overall it is engaging visitors and delivering a high quality, enjoyable and educational visitor experience. (Morris Hargreaves McIntyre, 2009b, p. 5)

Of particular note for the present purposes is the claim above that visits to this area within ZSL London Zoo are “educational”. This claim is only held up by a single statistic on self-reported ‘learning’ which will be discussed below. The quantitative findings from this Animal Adventure evaluation are compared with the quantitative results from the pre-refurbishment evaluation, with the following description of results which is labelled “Benchmarks”:

35% said it was better than they expected (8% Children’s Zoo)
Average dwell time = 31 minutes (10 minutes in Children’s Zoo)
68% were very satisfied (30% Children’s Zoo)
72% are very likely to visit Animal Adventure again (44% Children’s Zoo)
56% learnt something
(Morris Hargreaves McIntyre, 2009b, p. 5)

Critical Review. This evaluation is highly flawed on multiple levels, including representativeness, validity and generalizability. The report begins by incorrectly identifying this as a ‘formative evaluation’, when it in fact takes place after the exhibit area known as ‘Animal Adventure’ has already been completed. The first hurdle after that is to establish that the individuals who were sampled for this evaluation research
are representative of the larger population. There are two major limitations in the sampling approach. The first and most fundamental is that the report does not specify how respondents were selected, thereby indicating it was a convenience sample that reflects the schedule of the researchers rather than the task of gathering data from a representative sub-set of the larger population. Convenience sampling introduces many potential biases, and offers no reason to believe that the times and individuals selected are representative of visits to this exhibit within ZSL London Zoo. Furthermore, the ‘family groups’ methodology used in this study is highly questionable. ‘Recruiting two family groups’ in advance introduces potential bias – especially as it is not specified how these family groups were selected, thereby indicating biased convenience sampling. These problematic aspects of sampling undermine the report’s generalizations to the full population of visitors to the Animal Adventure area. Indeed, the use of quantitative statistical claims generalised to the entire population on the basis of 98 survey respondents is particularly problematic in light of these sampling limitations.

A large proportion of this evaluation involved qualitative data collection. In particular, it is stated that two focus groups and 35 ‘depth interviews’ were conducted. Despite labelling them ‘depth interviews’, there is little evidence of depth in either the data collection or analysis. Given the limited form of data presented, it seems likely that focus groups and interviews conducted for this evaluation were brief, thin and unrecorded. Such characteristics are anathema to good quality qualitative research in general and the claim to ‘depth’ in particular (Jensen & Holliman, 2009).

However, as minimal information is provided on the full scope of the qualitative data collection, I will focus on the qualitative data analysis, which is clearly highly limited.

For example, the following extract indicates how little analysis was conducted on the qualitative data – with just one line from the researchers, then a battery of unanalysed extracts:

Visitors loved being able to see the animals,
Wow look at that, look at the size of them, you know, and they are actually quite close, so I found myself going wow yeah, wow. Repeat ZSL
For me as well it was amazing how close we got to the animals. New ZSL
Animals are close up. You can touch them, know what they are like Exit survey
It’s been that traditionally when you go to the zoo you’re at least 15 metres away from anything, but you just go bang and they’ll go up a tree New ZSL
But it is in a traditional zoo and there’s like two or three viewpoints... there were so many vantage points and then the level that the kids can go and find stuff they don’t need you to hold them up or let them down which I thought was quite good. New ZSL
I think the llamas were nice, once you got to the llamas, we were surprised because they’re a bit vicious aren’t they, how close we could get to them. Repeat ZSL
We could see them sleeping and the kids love it. Repeat ZSL
Amazing really, and they were just lying there in the corner. Repeat ZSL
just feeling so close to the animals. Repeat ZSL.
It’s a very good experience of looking at animals to see what they’d be like
in real life (female 10)
How close you can get to the animals. You can touch them. Exit survey
(Morris Hargreaves McIntyre, 2009b, p. 16)

As can be seen in the example extract above, there is no effort to systematically analyse
the qualitative data presented in the report.

In the minimal gestures towards analysis that are provided, there is a surprising
interpretation of the llamas from a repeat zoo visitor that is quoted, which suggests a
problematic lack of learning in this setting.

I think the llamas were nice, once you got to the llamas, we were surprised
because they’re a bit vicious aren’t they, how close we could get to them.
Repeat ZSL [visitor]
(Morris Hargreaves McIntyre, 2009b, p. 16)

Yet, none of the data is analysed sufficiently or presented with enough contextual detail
to establish the representativeness and significance of this and other quotations
provided in the report.

Overall, this particular evaluation may provide some useful information. However, it is
not the “incisive, deep analysis” averred at the end of the report. Moreover, as indicated
above, it suffers from a number of basic methodological flaws, which undermine its
claims.

‘I Never Expected to See Such Big Tortoises Here’: Evaluation of the Galapagos Tortoise
Exhibit
This evaluation, also conducted by Morris Hargreaves McIntyre, was designed as a
summative evaluation of the new exhibit area in ZSL London Zoo devoted to Galapagos
tortoises3 (Morris Hargreaves McIntyre, 2009a). The report from this evaluation begins
by specifying the ‘brief’ that Morris Hargreaves McIntyre were given by ZSL:

The brief was to evaluate the Galapagos tortoises specifically looking at:

• Levels of engagement with exhibits i.e. use of interactives, text panels etc
• Which aspects of the exhibits visitors liked best
• Overall satisfaction with the experience
• Identifying any reasons why visitors may struggle to engage

3 Although outside the scope of this evaluation, a Komodo dragon enclosure was also introduced around
the same time.
• Establishing visitor outcomes and particularly learning outcomes

• Investigating whether there are any improvements that could be made

(Morris Hargreaves McIntyre, 2009a, p. 4)

Particularly notable for the present purposes is the objective of ‘establishing visitor outcomes and particularly learning outcomes’.

The methods of data collection included ‘exit surveys’ and a ‘visitor tracking’ element used to evaluate prevalence of usage of ‘interactive’ elements of the exhibit interpretation:

We administered 106 exit surveys at the exhibit between 28 August and 4 September 2009. We tracked visitor behaviour, observing and recording 54 different visitors between 28 August and 2 September 2009. We specifically focused on use of the mirror, the weighing scales and the voting column as well as behaviour in the exhibit overall, including dwell time. (Morris Hargreaves McIntyre, 2009a, p. 4)

These two methods were both adduced primarily through descriptive statistics, with a strong implication that the data collected from this small sample of visitors could be generalised across the entire population of visitors to ZSL London Zoo.

The ‘Main Findings’ reported are all in the form of aggregated descriptive statistics, as can be seen below:

40% of visitors said the exhibit was better than they expected.

72% of visitors learnt something.

Visitors were most likely to have a better understanding of the animals and where they live (32% strongly agreed), and their influence on Darwin’s theories (41% strongly agreed).

Some felt they learnt about threats to the islands (30%) and Giantism (28%).

Few felt they now understood symbiosis (11%), and the zoo’s conservation projects (13%).

(Morris Hargreaves McIntyre, 2009a, p. 4)

Note above that is stated that “72% of visitors learnt something”, not that they self-reported that they had learned something when asked a forced choice ‘yes’ or ‘no’ question on the topic. Thus, this statistic is not based on actual evidence of learning collected, only self-report. Indeed, the descriptive statistics provided for the different ‘learning outcomes’ are all derived from self-report data. Specifically, the following display of results also shows the positively framed Likert scale (level of agreement) items that were employed to measure learning in this evaluation. This graph is
introduced with the heading 'This chart shows you what proportion of visitors felt they had learnt specific facts and/or picked up the key messages in the exhibit':

**Figure 2: ‘Learning outcomes’ from Galapagos tortoise exhibit as measured by Likert scales, reproduced from evaluation report, page 18**

<table>
<thead>
<tr>
<th>Description</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neither</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>It taught me interesting facts</td>
<td>32%</td>
<td>42%</td>
<td>22%</td>
<td>1%</td>
<td>3%</td>
</tr>
<tr>
<td>I learned about island giantism</td>
<td>28%</td>
<td>25%</td>
<td>36%</td>
<td>8%</td>
<td>3%</td>
</tr>
<tr>
<td>I understand Symbiosis</td>
<td>11%</td>
<td>21%</td>
<td>43%</td>
<td>7%</td>
<td>13%</td>
</tr>
<tr>
<td>I learned about the Zoo’s conservation projects</td>
<td>13%</td>
<td>31%</td>
<td>37%</td>
<td>9%</td>
<td>10%</td>
</tr>
<tr>
<td>I learned about threats to Galapagos island wildlife</td>
<td>30%</td>
<td>25%</td>
<td>37%</td>
<td>2%</td>
<td>7%</td>
</tr>
<tr>
<td>I learned how Galapagos islands influenced Darwin’s theories</td>
<td>41%</td>
<td>19%</td>
<td>30%</td>
<td>5%</td>
<td>4%</td>
</tr>
</tbody>
</table>

These ‘findings’ detailed above are of particular interest for the present purpose as they get directly at the question of educational impact and public engagement with wildlife conservation. Some of these visitor outcomes are linked to what I will describe as ‘second order’ aspects of public engagement. The other results reported do not access learning or engagement, but are relevant to some potential pre-curors to learning or engagement, thereby placing them within the domain of ‘first order’ aspects of engagement.

94% used the viewing window and 71% liked this element the best.

62% used the weighing scales and 26% said they liked it.

48% used ‘be an island giant’ interactive but few engaged fully with it.

41% used the voting panels, and about a third voted (but some without reading any information).

68% used the information panels and 24% said they liked them, and 55% strongly agreed that the information was accessible.

(Morris Hargreaves McIntyre, 2009a, p. 5)

It is important to note that these quantitative results are implied to generalise to the full population of visitors to this exhibit, thereby making the above descriptive statistics
meaningful. However, this is the most limited form of quantitative data analysis, with all results aggregated together on each dependent variable. This provides no differentiation by age, gender, etc. which might allow us to extrapolate a useful hypothesis for future research. That is, these results do not offer any explanation of how, why, under what conditions or for whom these quantitative patterns may apply, they merely make general quantitative claims about visitor patterns which are completely dependent on this being a representative sample of the larger population of visitors.

Critical Review. This study suffers from fundamental flaws, including representativeness, validity and generalisability.

First, as with the previous evaluation reviewed, there is a fundamental problem with sampling in this evaluation study. Sampling is non-random, sampling size is small and there is no evidence that the sample can be considered representative of the larger population of visitors to this exhibit. Again, it is not specified how the sample of 104 individuals was selected, over what period of time, etc., which is very likely because it was a convenience sample collected all at once. This kind of convenience sample is subject to myriad possible biases. For example, the individual conducting the exit surveys may have selected possible respondents according to who looked likely to stop to give a response. Essentially, this failure to collect a quality sample renders the quantitative results largely meaningless as they cannot be reliable generalised to the larger population of visitors. Therefore, the findings are limited to only the individuals who were sampled, which limits their utility.

Despite this limited sample, there is a pattern of over-generalising in the study. Again, on the basis of this questionable (very likely non-random and biased) sample, the Morris Hargreaves McIntyre researchers generalise to the entire population of ‘visitors’ (saying for example that “94% of visitors use the viewing window”). This lack of representativeness fundamentally undermines the visitor tracking research as the patterns reported might be completely different for the larger population than the results for this small sub-set sampled.

Beyond the failure to establish a representative sample that could generate generalizable results, there are substantial problems with the validity of the measures used. Put simply, the survey items employed do not straightforwardly measure what they claim to measure. The evaluation claims to measure ‘learning outcomes’ but the main method employed is a forced choice ‘yes’ or ‘no’ question asking for a respondent’s self-report of learning. This forced choice approach is highly problematic and it is not clear what kind of ‘learning’ is being measured as this question does not specify. So even if respondents were not influenced by the social desirability bias and demand characteristics inherent in this question, they may answer ‘yes’ to indicate they have ‘learned’ when this self-reported ‘learning’ is something inaccurate (e.g. ‘I learned that Galapagos tortoises’ natural habitat is in Scotland”). Such patterns of negative learning
have been shown in a previous study of ZSL London Zoo (Jensen, 2010) and would be likely to be counted as positive (i.e., just as 'learning') in this kind of question.

A further validity problem with the measures used in this study centres on the Likert scale ‘level of agreement’ questions such as “I learned about island gigantism”. These questions are a highly biased way of assessing learning. The use of self-report data to measure learning is inherently problematic and overly simplistic.

Self-report measures, in addition to their low validity risk over-estimating impact insofar as there is a researcher expectancy bias (visitors saying what they think the researchers want to hear). This risk is exacerbated in this case by the fact that all of the Likert items are positively framed, thereby giving the visitor a strong signal on the expected results.

Moreover the questions asking visitors to self-report learning on different topics unrealistically requires the respondent to retrospectively assess their feelings about science, and then to assess that retrospective assessment against their current emotional associations with science. This is unrealistic and unlikely to yield valid responses that accurately reflect

The answer to this question should then be measured directly, rather than requiring pupils to self-report.

More fundamentally, there is a well-known social desirability bias in favour of respondents giving what they perceive to be 'the right answer' when given such clearly skewed questions. The following methodological paper on social desirability bias effectively summarises social desirability bias:

The basic human tendency to present oneself in the best possible light can significantly distort the information gained from self-reports. Respondents are often unwilling or unable to report accurately [...] for ego-defensive or impression management reasons. The result is data that are systematically biased toward respondents’ perceptions of what is "correct" or socially acceptable [...]. This phenomenon is called social desirability bias and has been found to occur in virtually all types of self-report measures and across nearly all social sciences literatures [...]. It can lead to the reporting of spurious or misleading research results. Prior studies have found that social desirability bias can attenuate, inflate, or moderate variable relationships (Zerbe and Paulhus 1987); increase measurement error (cf. Cote and Buckley 1988); and affect variable means (Peterson and Kerin 1981). Research that does not recognize and compensate for social desirability bias may lead to unwarranted theoretical or practical conclusions. (Fisher, 1993, p. 303)

Also, it would be much more valid if the Likert scale items were not so clearly leading / biased. (e.g. there are no negatively phrased items (they all are framed in the positive, saying “I learned…” – none saying “I don’t feel I learned anything new”).
To actually establish a causal relationship, one would have to conduct an assessment both before and after, as well as approaching the variable in a more valid way. Direct assessment of relevant knowledge both pre and post-visit is the obvious way to validly assessing learning outcomes, although additional longer-term measures would be desirable (Dawson & Jensen, in press).

While learning is the most relevant variable that has been poorly operationalized in this study, other variables such as ‘engagement’ are not convincingly measured either. The limited ‘observations/tracking’ conducted by measuring whether this small sample of individuals ‘looked at the panels’ or ‘looked at the mirror’ is hardly a sufficient measure of ‘engagement’. This kind of structured observation can be a useful starting point for an evaluation of this kind, but then follow-up questions are needed to determine whether people actually got anything out of the ‘looking’. Indeed, a much better method of evaluation would have been to capture ‘tracking’ data for individuals who are also included in a survey study, thereby allowing these two data to be directly linked at the individual level. Crucially, the analysis for this kind of approach would need to have the two data sets (tracking and survey) linked up to provide useful insights.

Finally, because the methods employed are very thin (e.g. no qualitative interviewing, follow-up questions, etc.), there is a lot of speculation in this report about what ‘caused’ visitors to behave in certain ways. For example, referring to the weighing scale, the report says “it appeared that people tended to play with it rather than seeming to understand the point of it”. There is no need for such uncertainty when asking a couple of follow-up questions would have provided a clear indication of the behaviour pattern observed.

**US Zoo and Aquarium Evaluations**

Although many are not publicly available, some zoos in the United States have commissioned evaluations, or conducted evaluations themselves. This section reviews the available examples of this work.

*‘Stingrays at Caribbean Cove’, St Louis Zoo*

The first report was published in December 2009 by St Louis Zoo. It was conducted to evaluation the impact of a new stingrays exhibit “where visitors were able to watch, touch and often feed cownose and southern stingrays in a warm, saltwater pool. The exhibit area is located under a new pavilion near Lakeside Cafe which houses a 17,000-
gallon pool, complete with waterfall and a lush surrounding landscape.” (page 3). This was a pay exhibition, requiring an additional fee from visitors in order to attend.

*Methods.* The sampling approach in this evaluation is questionable at best. It is described as follows:

> a respondent intercept survey methodology was utilized. A total of 152 adults were intercepted and given an evaluation to complete as they were exiting Stingrays at Caribbean Cove with their party. Only one person per party, over the age of eighteen, were allowed to complete the survey, and respondents were given a free stingray pen (retail value $6.95) as a token of appreciation. The evaluation was completed throughout the months of July, August and September, with a split of weekend (40%) and weekday (60%) completed surveys, which was representative of total visitation. To reduce the length of the questionnaire, two versions of the questionnaires were utilized with several different open-ended questions were only asked to half of the sample of respondents. (Niedbalski, 2009, page 3)

There is no indication here that random sampling was employed to ensure that each member of the population being studied would have an equal probability of being selected. Rather, this comprises a ‘quota sample’ which is claimed to be ‘representative’ because the split of weekend versus weekday data collection matched the total population parameters. However, without random sampling there is no way to be confident that the individuals selected within these two categories are representative of the larger population of weekday or weekend visitors. Moreover, only one person per ‘party’ was allowed to participate but it is not specified how this one person was selected from within the larger group. It seems likely that this process was governed by self-selection, thereby introducing a potential bias. Specifically, people who would put themselves forward to complete the survey might differ in an important way from the rest of the party sampled. These weaknesses in sampling methods are exacerbated by the subsequent application of inferential statistics to this non-probability (non-random) sample.

As can be seen in the limitations in sampling identified above, this report indicates a problematic understanding of research methods. This is underscored by the following statement at the end of the ‘methods’ section in the report:

>  

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This sample size of respondents may not provide results that are representative of the entire population of Stingrays at Caribbean Cove visitors. The results should be looked at as directional, rather than as statistically sound. (page 4)

This statement holds no epistemic validity. It is nonsensical to say that results that are not representative can be assumed to be 'directional'. Results are either representative or they are not. If they are not, then the results could be just as likely to point in an inaccurate 'direction' as an accurate one.

**Detailed Review of Results.** The results in this evaluation survey report are presented in graphs by question with limited explication or analysis. This section considers in turn some of these survey questions.

**Q.4 On a scale of 1 to 10, in which 1 is ‘dislike very much’ and 10 is ‘like very much’, how would you rate how you feel about stingrays before and after your visit today?**

Response options:

- Like very much (9-10)
- Like somewhat (6-8)
- Dislike somewhat (3-5)
- Dislike very much (1-2)

This scale item asking how much visitors ‘like’ or ‘dislike’ stingrays offers a very limited operationalization of visitor impact. Indeed, there is reason to question whether self-reported ‘liking’ of stingrays is really a good measure of impact. But what is fundamentally problematic is that this survey was only administered post-visit through exit surveys but respondents were asked to provide a response for ‘before’ and ‘after’ their visits. That is, the results for ‘before’ are based on asking respondents what they *would have* said before they entered, had the researcher asked them. This approach assumes that visitors are able to retrospectively reconstruct how they would have felt upon entry into the exhibit. This is a highly questionable assumption.

Other problems include the use of a 10-point Likert scale with no option for respondents to indicate that they had a neutral view of stingrays or that they had no prior opinion about stingrays prior to their visit. This flawed question framework alone casts serious doubt on the results. Finally, a paired samples t-test is used on the ‘before’ and ‘after’ ratings provided in this exit survey, despite the fact that the assumptions of the t-test are violated by the fact that this study is based on non-probability (non-random, not normally distributed) sampling.

**Q.5 Why do you like or not like stingrays?**
Question 5 is potentially more interesting (why do they like/not like stingrays), but it is very thin and because they don't have authentic before/after data, we can't see if these reasons changed due to the exhibit. Nevertheless, the results may provide some insight into why visitors find particular animals interesting or compelling.

Figure 3: Self-reported reasons for liking/disliking stingrays, Stingray Evaluation Exit Survey, St Louis Zoo, reproduced from page 8

There is no qualitative analysis of comments provided. Instead a ‘sample comments’ page is presented, with no evidence that these comments are representative. These are the positive comments provided.

Sample comments (why like): “So great to be able to touch them.” “Love the way they feel.” “Very social and interesting.” “Like – smooth and calming – soothes your spirit.” “I like them because they are helpful to the ocean.” “I like touching them and interacting with them.” “Never realized they were so friendly and awesome to feel.” “It was a lifetime experience.” “Docile - innocent.” “Seem to be a bit misunderstood.” (went from 4 to 8 rating) “Seem more intelligent than I imagined.” “They fly in the water.” “Have always interested me, after today I’ll have to read more!” “Because of their majestic form and nature.” “Unusual experience, not something we can do every day!” “Their behavior and interaction with humans is interesting.” (p. 9)
However, perhaps the most useful finding in this evaluation can be gleaned from the negative comments regarding stingrays, which are summarised as follows:

The majority of answers demonstrated why visitors seem to like stingrays, rather than dislike, with the exception of 8% who mentioned feeling afraid of them, or were worried about their stingers/barbs. (p. 8)

Specific comments within this category of negative comments reported with the concomitant negative shift in attitude indicated by the flawed measure discussed above include:

Sample comments (why not like): “Afraid.” (went from 4 to 7 rating) “Fear.” (went from 1 to 5 rating) “Because of their barbs.” (went from 3 to 10 rating) “My sister was stung by one, so it makes me iffy about them.” (went from 5 to 7 rating) “Scared of stingers.” (went from 4 to 10 rating) “Worried about jabbing me.” (went from 6 to 10 rating) “Killers?” (went from 1 to 10 rating). (p. 9)

Clearly, the negative experience of these visitors to the stingray exhibit was centred on a discourse of ‘fear’. This ‘fear’ discourse could point to a useful direction for future research to identify possible negative impacts from zoo visits and forestall these through targeted public engagement interventions (for example, discussing how and under what circumstances stingrays might be dangerous).

We next consider Question 7, which asks the visitor to self-report their level of consumption of interpretation content provided at the exhibit.

**Q.7 How much of the information on exhibit signs would you estimate that you read?**

Response options:

• All of it
• Most of it
• Some of it
• Very little
• None of it

The results are reported as follows:
Answers to this question are likely to be subject to social desirability bias (i.e. they would not want to admit to not reading the signs). Indeed, this question is a quintessential example of a self-report question the results from which should be treated with a great deal of scepticism.

This topic would have been more validly investigated using structured observations of visitors in the exhibit, as is acknowledged in this report.

69% of visitors claimed to have read ‘all’ or ‘most’ of the exhibit signs at Stingrays at Caribbean Cove. This percentage would likely be lower if an actual tracking study was completed, rather than relying on self-reported behavior. (p. 11)

Of course, the problem with this flawed self-reporting approach runs deeper than merely over-counting the level of information panel reading. If these self-reported panel reading figures are accurate, then this suggests that either the information panels are far more attractive to visitors than is typical or the sample that has been selected for the survey is highly atypical in a way that is likely to skew the results unrealistically towards a positive result from this evaluation.

To interpret these results, additional contextual information about the exhibit would be very helpful (how much signage is there, of what kind, etc.?). Moreover, within the bounds of survey study, a more valid approach would have been to ask what, if anything, the visitors remembered from the signage messages. This would limit the reliance on self-reports and provide more useful impact data.

The next question addresses the perceived queuing time from the visitors’ perspective.

*Q.8 On a scale of 1 to 10, in which 1 is ‘very unreasonable’ and 10 is ‘very reasonable’, how would you rate the length of time you spent in line?*
This question on perceptions of queuing time is also meaningless without some context (i.e. how long did the person queue? Was there anything to look at in the queue?)

However, a useful bit of analysis can be found in the cross-tabulation of mean satisfaction with waiting time as a function of crowd density. This showed unsurprisingly that high crowd density was associated with greater dissatisfaction about queuing time.

**Crowd level Mean**

- Light 9.3
- Moderate 9.0
- Heavy 8.3

While this finding is not methodologically robust, it raises an additional issue to consider in exhibit design. That is, managing visitor density (see Moss, Francis & Esson, 2007) includes the issue of limiting dissatisfaction with queuing times.

The next question addresses the key question of impact on visitors’ conservation behaviours.

**Q.10a Did you pick up a Seafood Watch Card?**

This is one of the very rare examples of evaluations in zoos attempting to assess pro-conservation outcomes. However, the data for this item comprised a much smaller sample size \(n=70\), which explained by saying that this question was only asked when the Seafood Watch cards were ‘available’. 51% said ‘yes’ they picked up the card, while 49% said ‘no’. A follow-up question for those who said ‘yes’ asked \(n=36\), “How likely are you to use the card when purchasing seafood?”. Reported results were as follows:
Problematically, there is a substantial social desirability bias in asking those who have picked up the card to self-report whether they intend to use it. It would be much more valid to track whether such intentions translation into action over time.

Nevertheless, the Seafood Watch card approach to promoting pro-conservation behaviour (a UK equivalent of this card can be found here: [http://www.fishonline.org/information/MCSPocket_Good_Fish_Guide.pdf](http://www.fishonline.org/information/MCSPocket_Good_Fish_Guide.pdf)) deserves further exploration as an intervention to assess both its utility for sea life conservation and its accessibility and utility for zoo visitors trying to take positive pro-conservation steps.

The major strength of this evaluation is the heavy use of open-ended qualitative questions, which allows it to offer some useful insights despite its methodological flaws. In particular, it offers insights into touch experiences in zoos, a domain about which there is limited evaluation knowledge.

**ZSL London Zoo Formal Learning Programme**

I conducted a study designed to overcome some of the limitations of prior research and rigorously assess whether zoo visits can foster significant increases in learning about scientific ideas and attitudinal change regarding wildlife conservation. The following passage is an extract from the report on this study.

The study described in this report represents the largest ($n = 3018$) and most methodologically robust investigation of the educational value of zoos for children and adolescents ever conducted worldwide. This research evaluates (1) the impact of ZSL London Zoo Formal Learning educational presentations and unguided zoo visits, (2) pupils’ development of new knowledge and (3) pupils’ perceptions of zoos, science and wildlife conservation. Using methods developed during a pilot study conducted in
spring 2009 with primary school (Wagoner & Jensen 2010)\textsuperscript{6} and post-16 pupils (Jensen & Wagoner, under review)\textsuperscript{7} attending London Zoo Formal Learning presentations, both the quality and quantity of learning are directly assessed. The present study is aimed at both informing practice at the ZSL London Zoo Discovery & Learning Department and at developing robust evidence of the degree to which zoo-based science and conservation education can have a positive impact for children and adolescents.

**Executive Summary**

- There was a strong statistically significant increase in scientific learning about animals and habitats (increase in knowledge) from pre- to post-zoo visit. This is the strongest evidence to date of the educational impact of visiting the zoo for children and young people.

- Zoo visits supplemented by an educational presentation almost doubled the increase in scientific learning for self-guided visits. That is, the addition of an educational presentation almost doubled the aggregate level of learning that occurred during zoo visits based on a key measure used in this study.

- Overall, 91\% (n=2568) of respondents showed a positive change in at least one of the educational, conservation-related, satisfaction or enjoyment outcome variables.

- Overall, 53\% (n=1427) of pupils’ who visited the zoo as part of the formal learning programme evinced a positive development in at least one area pertaining to zoos’ education and conservation functions, understanding of animals and their habitats, personal concern for endangered species and empowerment to participate in conservation efforts\textsuperscript{8}.

- On the open-ended thought-listing measure, “Animals” and “Fun” were the top ranked concepts children associated with the zoo in both pre- and post-visit questionnaires.

- ‘Learning’ moved up from the 11\textsuperscript{th} (Before) to the 3\textsuperscript{rd} (After) most mentioned concept associated with the zoo. ‘Habitats’ moved from the 9\textsuperscript{th} (Before) to the 4\textsuperscript{th} (After) ranked concept. This suggests that pupils increased their perception of

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\textsuperscript{8} These positive development metrics are drawn from the subset of survey respondents (n=2691) who had not previously selected positive responses to questions in all of these areas in the pre-visit survey.
the zoo as associated with scientific learning and concepts as a result of their visit to ZSL London Zoo.

- “Cages” moved down from the 5th (Before) to the 13th (After) ranked concept for pupils on the thought-listing measure, suggesting that negative perceptions of the zoo decreased as a result of the zoo visit. An aggregate analysis of cage-related concepts showed a decline from 365 mentions pre-visit to just 36 post-visit.

- Words associated with conservation (e.g. “saving”, “extinction”) became more prevalent in the post-visit thought-listing data. Specifically, an aggregate analysis of thought-listing data showed a 34% increase in conservation-related ideas from pre- to post-visit.

- There was a statistically significant increase in pupils’ agreement with the statements “zoos are for learning about animals” and “zoos are for saving animals from extinction” from pre- to post-zoo visit.

- There was increased appreciation for a broader range of animal species, especially invertebrates (“bugs”), revealed through qualitative analysis of pupils’ annotated drawings and quantitative analysis of thought-listing data.

This report concludes as follows:

There is clear statistical evidence that educational presentations resulted in significantly improved rates of positive development in pupils’ science learning. Surprisingly, this impact from the educational presentations generalised beyond the specific habitats that were the focus of the presentations. For example, an educational presentation on rainforests could yield a positive development in understanding of deserts as of rainforests. Thus, this study suggests that educational interventions focused on concepts relevant to the zoo context can yield positive results across a broad spectrum of knowledge and attitudinal indicators. That is, concepts learned to help understand the relationship between particular animals and their natural habitats can be generalised by pupils for use in understanding new wildlife species encountered at the zoo.

However a key element of this research is self-guided zoo visits. This research indicates that a sufficient level of scaffolding, priming and anchorage can direct the inherent curiosity-generating impact of viewing live animals towards the desired educational outcomes of increased science and conservation learning. Given the present findings, it is clear that visitors that do not experience an additional educational intervention from the zoo are not learning as much as they could be if they were better equipped by zoo educators. As such, a fundamental practical recommendation from this study is that the zoo needs to dramatically expand and improve its interpretation and educational
provision within the zoo itself in order to maximise educational impact. The current methods of interpretation are yielding significant learning, but with the right interpretation or educational interventions this level of learning could be dramatically enhanced.

A number of other findings from this study also have practical implications for zoo-based science and conservation education. For example, knowledge of the kinds of ideas that tend to be salient for visiting children could be used to guide the framing of interpretation within the zoo. One example is the finding that olfactory aspects of the zoo visit were memorable for especially primary school pupils. Indeed, variations on the concept of ‘smelly’ were a consistent and durably salient feature of children’s experience of the zoo. Zoo educators could use the knowledge that this idea is salient to children in order to design learning messages that focus on animals’ smells and then scaffold broader learning onto this base.

Another example is the widespread awareness of ‘cages’ as a possible index of ethical concern amongst pupils in pre-visit thought-listing and to a lesser extent drawing data. Although this concern declined significantly over the course of the visit, there was evidence in individual cases that ethical concerns were acting as a barrier to both learning and enjoyment during the zoo visit. Given that this pattern was visible even in the youngest pupils sampled for this study (age 7), the current pedagogical approach at ZSL of only directly addressing ethical concern at the secondary and post-secondary levels in formal learning presentations and not at all in general zoo visitor interpretation (which is the main message delivery mechanism for self-guided visits) should be reconsidered. Moreover, findings such as the gap between the ZSL formal learning team’s success in fostering personal concern for wildlife conservation on the one hand and a feeling of conservation self-efficacy on the other hand point to clear directions for pedagogical development for zoo education.

Basing zoo education on this kind of empirical research has the potential to maximise the attracting power of education messages as well as their ability to effectively engage visitors’ memory. That is, it should be possible to connect scientific and conservation messages with the salient phenomena at the zoo to maximise positive learning impact.

In addition, the positive results achieved by ZSL educational presentations featuring live animals in terms of enhancing appreciation for biodiversity offers some of the first empirical evidence supporting the use of touch within live animal presentations as an educational tool. In particular, allowing children to touch a Madagascan cockroach made a substantial impact on children attending educational presentations, fostering greater appreciation for these conventionally uncharismatic but ecologically important animals. However, the results also suggest caution in the case of charismatic animal species used in zoo education, particularly if they are behaving in any way that is unnatural. Moreover, taking animals out of a naturalistic enclosure to present to children within an educational presentation in school was shown to have an inherently de-contextualising
negative impact. Thus, there must be a stronger countervailing reason (e.g. fostering appreciation for conventionally under-appreciated animal species) to justify the risk of incurring this educational debit of de-contextualisation.

Finally, the ways in which publics understand the relationship between animals (both human and non-human) and natural habitats bears directly on zoos’ efforts to promote wildlife conservation. This is because the critical connection between endangered animals and their increasingly degraded wild habitats comprises the basis for understanding the need for conservation and the kinds of conservation action necessary. That is, knowledge of the animal – habitat relationship is the fundamental building block for learning about wildlife conservation. While it may be possible to develop short-term pro-conservation visitor actions such as one-off donations in the absence of such understanding, I would argue that engendering a long-term and holistic commitment to conservation requires learning about the context and basis for current wildlife crises.

**Conclusion.** Overall, this research indicates that visiting the zoo can yield both positive and negative learning outcomes. The risk of negative outcomes is greatest when there is not a naturalistic or immersive context for the viewing of live animals (e.g. outreach presentations in school). Within the zoo context, negative outcomes are much more likely when pupils have not been furnished with the conceptual tools they need to make the most of the experience of viewing live animals. Moreover, positive outcomes can be substantially enhanced by the provision of such conceptual tools.

For those pupils who enter the zoo with a positive or neutral perception of zoos and effective scaffolding by teachers, parents or other sources, self-guided visits can yield significant gains in knowledge and positive transformations or strengthening in pro-conservation attitudes. However, for pupils with insufficiently present, active and knowledgeable support, they are much more likely to benefit from education officer-led visits, which provide context and conceptual scaffolding tailored to facilitate learning from the zoo collection. Nevertheless, even within self-guided visits, the vast majority of pupils showed positive development on at least one of the dimensions included in the present survey instrument. As such, this study provides for the first time large-scale, reliable and generalisable evidence of zoos’ positive impact on children and adolescents’ scientific and conservation learning. Zoos will need to consider the overall finding that educational interventions can yield significantly improved learning outcomes on these dimensions in order to maximise impact both within and outside the formal learning context.
Methods and Sample for Critical Review

This report draws upon ethnographic observation and textual analysis of public engagement practices and communication through information panels at European zoos and aquaria.

The zoos and aquaria featured in this analysis include (among others):

- Skansen, AKA Stockholm Zoo (Sweden)
- Kolmarden Wildlife Park (Sweden)
- Durrell Wildlife Park (Jersey, Channel Islands, UK)
- Chester Zoo (UK)
- ZSL London Zoo (UK)
- Paignton Zoo (UK)
- L'Oceanografic Aquarium (Spain)
- BioParc zoo (Spain)
- ZOO Ljubljana (Slovenia)

In addition, a number of non-zoo sites and examples of conservation messaging have also been analysed to consider further possibilities for conservation messaging in zoos and aquaria.

Results: First Order Aspects of Engagement with Wildlife Conservation

The foundational aspects of engaging publics with wildlife conservation in zoos and aquaria have been defined as ‘first order’ in this report. These aspects include addressing basic visitor needs, providing conservation messaging in formats that are accessible to visitors and ensuring that other pre-requisites for impact have been addressed.

Hierarchy of Visitor Needs

Visitors have a hierarchy of needs that is nearly universal: they have basic needs such as shelter, food, drink and toilets that must be accounted for before we can expect them to focus on the wildlife conservation messages that zoos or aquaria might wish to communicate. As we travel further up the ladder of visitors’ needs, we will find that there are a number of pre-requisites for the unique contribution of zoos, namely live animals, to be able to promote pro-conservation visitors outcomes. This section discusses these precursors to zoo visitor impacts, illustrating points with specific examples from European zoos.
The need for shelter
In this positive example at Paington Zoo, the need for shelter from the often rainy British weather has been addressed with the simple solution of rain protected walkways for visitors. This makes it possible for visitors to see more of the zoo on rainy days and also offers some protection from the sun on particularly hot days in the summer.

Figure 6: Sheltered Visitor Walkway, Paignton Zoo, UK

Simple actions like providing sheltered walkways can help to provide the foundation for higher-level goals relating to public engagement with wildlife and conservation.

Animal Visibility as Precursor to Conservation Education
An important first step to live animals’ role in inspiring interest and commitment to pro-conservation aims is visibility. As can be seen in the examples below, good animal visibility offers the opportunity for visitors to encounter animals in a way that holds their interest:
The kind of interest, emotional response and learning than can come with seeing live animals (e.g. Jensen 2010) depends on such good visibility.\(^9\)

Obviously, if visitors are unable to see live animals during their zoo visit, then those animals’ affective impact will likewise not be felt. Whilst there are good reasons for limiting animal visibility in some cases in the interest of animal welfare, zoos must consider ways in which they can maximise visitors’ ability to see animals within the bounds of these welfare concerns.

This section identifies two problematic patterns within the context of animal visibility and one positive direction for zoos to consider in order to enhance this fundamental precursor to zoo-based conservation education. Firstly, there is a tendency amongst a substantial proportion of European zoos to restrict visibility and viewing area size unnecessarily. Secondly, there are sometimes visual obstructions or impediments within enclosures that inhibit animal viewing. Mitigating these issues is an important first order step in enabling live animals’ contribution to conservation education and engagement. Ways of managing problems with low animal visibility from educational and engagement perspective are identified, including the use of ‘integral’ (additional, usually smaller) species within an exhibit focused around less visible charismatic species to ensure that visitors do not walk away empty handed from an investment of time and attention in trying to see live animals within a zoo setting.

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Purposely Restricted Viewing Areas

Some zoos, in pursuit of unproven benefits such as enhancing anticipation or a sense of adventure, have purposely curtailed the amount of viewing space available for visitors at exhibits. Given prior research showing that larger viewing areas are preferred by visitors (A. Moss, Francis, & Esson, 2008), this pattern is particularly unfortunate. In the images below, visibility has been purposely curtailed to small windows cut into wood. This approach both unnecessarily restricts viewing points (a particular problem on busy days) and raises expectations that if a visitor looks through this window, they will be rewarded with a good view of an animal. Moreover, children are left unable to see through many of these portals, causing further problem for family visitors.

Figure 8: Intentionally Restricted Visibility, Paignton Zoo (UK), Crocodile Enclosure, 2011

Figure 9: Intentionally Restricted Visibility, Durrell Wildlife Park, Lemur Enclosure in 'Karindy Forest' Zone, 2010
A further argument against this kind of distributed but intentionally restricted provision of viewing areas is offered by research on the role of visitor density, suggesting that locations with no visitors present are least likely to draw in other visitors’ interest.

Zero density however seems to be the least successful in attracting visitors. It is worth noting that zero density seems to have a larger effect on visitors’ stopping choice than very high densities. This is perhaps because if no-one is viewing, others may believe that there is nothing worth stopping for (A Moss, Francis, & Esson, 2007, p. 2).

The kind of viewing areas provided above decreases the likelihood of having a sufficient visitor concentration to draw the interest of other visitors. Thus, wider areas with greater visibility must be seen as preferable based on current evidence.

Visitor Vision in Humid Conditions
Of course, exhibit design is not the only factor in animal visibility. Humid conditions in reptile houses in particular routinely fog up the glasses of visitors, impeding their visibility. This can be addressed with simple solutions by the zoo, as can be seen in Paignton Zoo’s reptile and amphibian house below:

Figure 10: Glasses warmer at entrance to reptile house in Paignton Zoo, UK

Implications of Animals Not Being Visible within Enclosure
Sometimes, zoos have provided plentiful viewing spaces, but the enclosures themselves are too overgrown for visitors to see animals most of the time. This may be a function of animal welfare restrictions, however if such restrictions render that animals will not be visible most of the time, this should be stated in the exhibits interpretation in order to manage visitor expectations. Otherwise, visitors are likely to experience the frustration of looking carefully to try to see the animals, but failing to do so. This pattern of a lack of animal visibility can be seen in the following example.

Figure 11: Overgrown enclosure limiting visibility, Durrell Wildlife Park, 2011
Moreover, the visibility of animals within enclosures can also be compromised by the use of glass within viewing areas that is reflective and thereby obscures the view of the animals, and can inhibit a sense of closeness to the animals even when they are technically visible. One example of such visibility obstructing reflectiveness can be seen below.

**Figure 12: Example of visibility obstructing reflectiveness on indoor animal enclosure window, London Zoo, 2011**

The reflectiveness of the glass limits visibility of the animals, as can be seen in the example above. This problem could be easily addressed with the application of an anti-reflective coating.

As an addendum to this section’s general points about visibility within animal enclosures, it should be noted that the acceptable nature of a lack of animal visibility for welfare reasons is most justifiable for animals that are part of a zoo collection for conservation reasons. Animals that are part of a zoo’s collection purely for ‘educational’ reasons should not be selected for this role if they react negatively to the presence of visitors. Rather, zoos’ complement of educational animals should be exclusively comprised of animals that react well to human presence and that it is therefore possible to keep visible and ‘on show’ for most of the time.
Managing Low Visibility Animals: Good Practice Example

Studies should be undertaken at zoos to identify whether any particular enclosure has animals that are not visible for an extended period of time. Once identified, additional high visibility species can be placed either within the enclosure itself or at the outside of the enclosure, next to where visitors will be standing. In the latter case, this could be insect species or other smaller animals that would otherwise not draw a large amount of primary interest from visitors.

One notable example of this practice can be seen in Chester Zoo’s Jaguar exhibit, which is primarily focused on the jaguars but has an open enclosure with leaf cutter ants and other species which nevertheless draws a substantial amount of interest from visitors (particularly when the jaguars are not visible). These animals were purposely included within this exhibit to mitigate the risk of visitors not seeing any animals during their visit to this enclosure as is stated in the following extract from a paper by Chester Zoo education staff published in a practitioner journal:

> Contain integral species in separate enclosures. Integral species act to illustrate biodiversity, reminding visitors that flagship species are part of an assemblage of species in an ecosystem. They also provide an alternative animal experience should the flagship species not be visible. During the study the integral species in SOJ were poison arrow frogs (Dendrobates sp), butterfly goodeids (Ameca splendens) and leafcutter ants (Atta cephalotes). (Francis, Esson, & Moss, 2007, p. 21)

The effectiveness of this approach can be seen in the photograph below, which shows visitors taking pictures of the leaf cutter ants, with the jaguar enclosure behind them.

**Figure 13: Visitors attending to secondary species, Chester Zoo Jaguar Exhibit, 2010**
Moreover, the study on visitor patterns within this exhibit found that visitors spent an average of 10% of their time looking at these ‘integral species’ (like the leafcutter ants) in addition to the 32% average time spent looking at the ‘flagship species’ (jaguar). This suggests that despite the disproportionate marketing and focus on flagship species such as jaguars, given the opportunity visitors will still choose to spend some of their time looking at other species such as the leafcutter ants, thereby expanding the range of live animals they saw during their visit (and potentially there sense of biodiversity).

This approach offers the advantage of enhancing interest from visitors in less charismatic species through their proximity to larger or more charismatic species, as well as ensuring that visitors do not invest time in an exhibit only to walk away without having seen any animals.

**Gaining and Maintaining Interest and Attention**

A crucial first order issue facing zoo-based conservation education is the need to gain and maintain visitors’ interest. Live animals comprise a major asset for engaging the visual sense of visitors when they are visible (as discussed above). However, zoos can also draw in visitors’ interest and attention by targeting other senses.

*Intentional Use of Smell in Zoos*

The provision of ‘smell boxes’ has become commonplace in many zoos, providing visitors with relevant scents to enhance the messages zoos are trying to communicate with visitors. The following example of such a smell box exhibit is called ‘Smells from Madagascar’.

**Figure 14: ‘Smells of Madagascar’ interactive exhibit at Durrell Wildlife Park**

While this example (above) has the strength of targeting a non-visual physical sense in order to gain visitors’ attention, it has the limitation of not being directly tied to zoos’ unique engagement tool: live animals. In this case, the smell-oriented exhibit on the ‘Smells of Madagascar’ is located away from the nearest live animals (viz. lemurs). The ideal scenario is when multi-sensory forms of engagement can be deployed to complement visitors’ engagement with live animals.
Unintentional Role of Smell in Zoos

A key piece of research on this topic of smell in zoos was conducted by Lindahl-Elliot (2006) at Paignton and Bristol zoos. Based on ethnographic research at these two sites, Lindahl-Elliot noted a pattern in visitors’ responses to the Ape houses in both Paignton and Bristol zoos:

The display’s indoor viewing area is also a marvelously smelly place. In the course of conducting ethnographic research with some thirty-five families [...] it became apparent to me that especially the younger visitors had a strong reaction to this aspect of the display. In most cases the reactions involved exclamations such as “Phew! It’s smelly Mummy!” [...] In a few cases there was a stronger response: four of the children refused to go into this, and indeed into any of the more pungently aromatic displays in either zoo, and the parents of one family reported that one of their children had begun to retch the first time that they entered the Ape Centre. (Lindahl-Elliot 2006, p. 204)

Counter-intuitively, it is argued that such reactions to the smells produced within a zoo can be positive due to its status as ‘out of the ordinary’.

While some of the children responded with physical revulsion to the smells, many, if not most reacted with a mixture of surprise, disgust and delight: here was something not only out of the ordinary, but something that provoked a paradoxical pleasure. (Elliot 2006, p. 204)

Elliot argues that such smell experiences are defined by a strong sense of immediacy and ‘surprise’ sparked by the perceived strangeness of the smells.

When, for example, a child experiences the smell, holds her or his nose, and says “Phew! It’s smelly in here,” she or he produces a sign that is at once a conventional symbol insofar as it entails the use of words; an index that “points out” the smell and aspects of which are in a real physical relation to the smell; and an icon, that is to say a likeness of the sense of surprise and revulsion felt at the smell: the child’s parents can see the child holding her/his nose (which is itself of course a conventional sign), but can also hear the surprise in the exclamation even as they themselves sense the pungent smell. (Elliot 2006, p. 212)

From an educational or engagement perspective, this immediacy translates into attention and interest, which then holds potential to establish a first order aspect of

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such engagement. Once attention is gained, this opportunity for learning or engagement may be put to good use by the zoo or squandered, but it is an opportunity nonetheless.

Animal Proximity and the Role of Touch
The perception of being ‘close’ to animals is very important to visitors. In addition to the issues relating to visibility discussed above, some zoos have introduced ‘touch’ elements to allow visitors direct contact with animals during their visits. The following image shows a touch experience at Leningrad Zoo\(^{11}\):

**Figure 15: Touch Experience with Pygmy Goat at Leningrad Zoo**

The following image shows a touch experience provided at ZOO Ljubljana (Slovenia):

**Figure 16: Touch experience at ZOO Ljubljana (Slovenia)**

*Image courtesy of Irena Furlan, ZOO Ljubljana*

In the case of Skansen (Stockholm Zoo), the main explicit touch opportunity is with pygmy goats that are unsupervised in an enclosure where visitors can come up to them and touch them. The animals are able to exit this touch enclosure and go into a second enclosure if they so choose.

This ‘touch’ experience attracted a great deal of interest and was much busier than surrounding enclosures. There is a reasonable prima facie argument to be made that such touch experiences enhance visitor satisfaction.

**Figure 17: Touch experience at Skansen (Stockholm Zoo), 2010**

Despite the take up and potential benefits for visitor satisfaction, there is clearly a need to be careful in the design of ‘touch’ experiences. First of all, from an animal welfare perspective, care needs to be taken. In this case at Skansen, the unsupervised nature of the experience allowed for several instances of problematic handling of the animals by children, including an attempt to ride one of the gates and a number of instances of pushing them (see example below).
This example (above) indicates that a sign calling for parental supervision is insufficient to ensure good treatment of the animals.

The second major issue is harnessing the affective impact that may be associated with a touch experience and linking it to conceptual learning (e.g. about how a particular animal’s skin or fur coat is adaptive for its natural environment) or a conservation message (e.g. hunters killing the animals for these skins or furs and therefore visitors need to make sure not to buy anything like that which might fuel the market).

It is this additional (second order) issue that was highlighted in the research conducted by Jensen (2011) at ZSL London Zoo, which indicated that animal touch experiences were a valuable learning tool.

In presentations featuring the cockroaches, the pupils are usually able to gently stroke the cockroach, which may contribute to the memorability of this animal for pupils. Indeed, the strong pattern of increased appreciation for a wider range of animal taxa may be the strongest evidence to date of the value of including touch within educational presentations. Unfortunately in the case above the pupil’s shift to favour the cockroach over the polar bear also came with a decrease in detail about the animal’s natural surroundings. As such, despite the positive change of developing interest in a non-charismatic animal species, this case was coded as ‘negative change’ with the content analysis of the annotated drawing data. This pattern of declining attention to the surrounding environment after outreach visits is further explored in the ‘Negative Change’ section. (Jensen 2011, p. 62)

Visibility and Availability of Interpretation

Following a similar logic to animal visibility, it is important to note that at a very basic level, informational signs are only useful if they are visible. In a minority of zoos and
aquaria assessed during this study, signs were not properly lit, thereby making it nearly impossible to read the content on them. In the following example, a good overall message (“working together, we can save them”) is undermined by the lack of proper lighting.

Figure 19: Poor lighting undermines delivery, Oceanografic aquarium, 2011

When lighting is available, it is important to consider which method will be most appropriate and effective and drawing visitor interest. For example, there was some evidence in prior research conducted by the author this report at ZSL London Zoo that backlit signs in darkened areas are more effective and drawing interest from visitors than front lit ones.

Another recurring issue in this domain is the physical placement of signs. When zoos try to communicate extended informational messages about conservation, they often end up placing the signs in areas apart from the animals. Unsurprisingly visitors very rarely go out of their way to look at these signs, which may be perceived as intimidating given they are filled with text.

Figure 20: Excessively detailed conservation information panel placed in low visitor traffic location, Paignton Zoo, 2011

Such isolated interpretation panel placement may be linked to the flawed assumption that more extensive message content within an interpretation panel is necessarily better (and the only space for more message content is away from the animals). However, this view is not realistic. It is much more realistic to focus on
simple and straightforward messages that are limited in quantity and made relatable for visitors. Where it is desirable to provide additional detail for visitors, this should not be done on information panels. Instead, brochures, websites, apps and other message delivery systems designed for optional consumption that can continue off-site should be used. An example of this approach can be seen in the bottom right hand corner of the image above.

Indeed, there is no reason to believe that a fixed sign is an effective medium for delivering such large amounts of text-based information, particularly within a non-formal setting. The more realistic approach to the use of such signs is to focus on communicating clear core ideas with small amounts of text to elaborate in certain key areas, and extensive use of vivid imagery.

Panels filled with text should be replaced with informational leaflets, which visitors can take away with them and read when it is convenient (e.g. when they can sit down). Information panels around the zoo should focus on providing just the information necessary to guide the interpretation of the animal viewing experience and direct it towards the desired pro-conservation actions. For example, further details about particular projects that the zoo is involved in can be provided through leaflets, text message (SMS) or the web upon request.

Visibility of Text on Information Panels

As can be seen in the example from the reptile and amphibian enclosure area, the use of small font raises the effort level required by visitors in order to take in this message.

**Figure 21: Small Font Size on Information Panel, Durrell Wildlife Park, Reptile and Amphibian House, 2010**

![Image of text panel]

The following additional example shows a case in which there was too much text to be placed on the sign to begin with, but the zoo’s admirable efforts to provide the
interpretation in three languages compounds the problem of small and difficult to read text.

**Figure 22: Small font on information panel, Bioparc (Valencia Zoo), hippopotamus enclosure, 2011**

![Small font on information panel](image1)

As can be seen in the examples above, too much text in font that is too small makes it difficult for visitors to gain anything from the information panel.

Other kinds of problematic decisions in the way text is printed on signs can also interfere with visitors’ ability to read the sign, thereby making it impossible for the message to reach such visitors.

**Figure 23: Low visibility text on information panel, Bioparc (Valencia Zoo), Gorilla enclosure, 2011**

![Low visibility text on information panel](image2)
The example above shows the use of white text on a cluttered mixed colour background, which severely compromises visibility. Such issues with the readability of information panels comprise a primary barrier to conservation learning and engagement.

**Need for Visitor-Centred Design of Viewing Areas**

The viewing areas sometimes include unnecessary deterrents to the free viewing of the animals by visitors of all ages. However, it is particularly important for viewing areas to be made in such a way that children can see the animals without having to climb up fences or lifted onto objects by their parents. Moreover, the visual aspects of ensuring handicap accessibility should also be taken into consideration.

The following example from Durrell Wildlife Park shows that when visitors are not provided with appropriate viewing points (in this case, the child would not have been able to see the bears from the ground), they will often adapt the viewing environment. As can be seen in the image below, such adaptations can lead to potentially dangerous viewing behaviour.

**Figure 24: Encouraging problematic visitor behaviour through viewing area design, Durrell Wildlife Park, Gorilla enclosure, 2010**

In the example above, safer behaviour could have been encouraged by providing a raised viewing area that children could use a safe distance away from the enclosure edge.

**Managing Visitor Flows**

As a precursor to conservation education and engagement, visitors need to be able to find their way around the zoo or aquarium. To optimise their experience and the range of both live animals and engagement materials they encounter during their visit, it is particularly important that sufficiently clear and plentiful guidance is offered for visitors to ensure that they make their way through the entire zoo. Without such
guidance, many visitors will be unaware of parts of the zoo that they could have seen, thus making that aspect of the zoo’s resource investment in their animal collection and conservation education ineffective per se. In some cases the quantity, quality and clarity of signs meant to guide visitors around the zoos assessed in this study was insufficient for ensuring that visitors had the kind of guidance, cues and suggested directions needed to facilitate their engagement with all parts of the zoo.

**Unrealistic Expectations of Visitors**

Some of the expectations placed on visitors by the zoos assessed in this study, regarding assumed interest in reading extensive text panels and behavioural instructions are not realistic for a non-formal setting such as a zoo. For example, it is not reasonable to expect zoo visitors to stop and read a lengthy list of rules before they enter an exhibit, much less to obey them. In the following example, this information panel with a list of behaviour rules appeared at one side of the ‘cave’ area, while most visitors went to the other side in order to see the hippopotamus underwater.

**Figure 25: Unrealistic visitor expectations evident in information panel, Bioparc (Valencia Zoo), cave exhibit area, 2011**

![Image of information panel]

Therefore, this example (above) is unrealistic at the content level but also in terms of its placement location within the larger ‘cave’ exhibit area.

**Excessive Scientific Labelling and Information**

Zoo signs that misjudge the typical patterns of visitor interest fall into two tendencies: to (1) include scientific labelling and (2) excessive information. Both tendencies can be seen in the following example:
Visitor Behaviour Management

Indeed, signs like the one below which appears at Fota Wildlife Park in Cork, Ireland and the other at the entrance to Durrell Wildlife Park's aviary are not likely to yield positive results. Rather, pathways and viewing areas should be designed so that visitor flows are managed without the need for explicit instruction and conscious visitor compliance.

Figure 26: Excessive quantity and scientific framing of information on a single sign, Paignton Zoo, UK

Figure 27: Unrealistic Assumptions of Visitor Behaviour, Fota Wildlife Park, 2011
If there are important behavioural instructions for visitors, these should be relayed through audio or video instruction, or a single very clear message that is repeated at multiple points in simple language.

**Distracting Elements in Zoo Interpretation**

In order for pro-conservation and scientific messages to reach visitors and hold their attention, one pre-requisite is to avoid psychological ‘noise’ that might distract from these messages. One source of possible distractions in many European zoos is the unnecessary elements have been included within enclosures or the surrounding themed areas such as ‘Africa’ as cultural symbols to indicate the geographical region being represented. However, the precise cultural symbols and cues that have been given in many zoos are confusing and difficult to interpret.

In the example below, the skink exhibit in the reptile and amphibian house at Durrell Wildlife Park includes traces of human existence. These traces were left intentionally by zoo staff to conjure the idea of a research field station in visitors’ minds.
However, it is unclear to visitors why the human elements have been included in this exhibit, leaving a range of alternative explanations to emerge. One explanation that emerged in a discussion with visitors was that there had been builders working in that enclosure who had left their shoes.

Potentially more problematic than the confusing elements in the skink exhibit shown above is the cultural stereotyping evident in the kinds of representations of non-Western locations seen in zoos. The pictured example is from a tiger exhibit and is intended to represent this species’ nearby human culture in Asia.
Other common examples include the use of oil drums and rusted corrugated iron as typical symbols of ‘Africa’ included in zoos. These stereotypical elements in zoo design raise particular questions about the rationale for expending scarce resources to create them and place them around the zoo. It is doubtful whether visitors are interpreting them as intended, and they run the risk of reinforcing stereotypes about these non-Western settings.

**Unnatural Enclosure Design Elements**

Whilst immersive enclosures with plentiful visual cues (typically, plants) regarding the displayed animals’ natural habitats can be effective at subtly imparting conservation learning for visitors regarding the link between animals and their natural habitats (Jensen, 2010), some of the zoos assessed present animals within stark enclosures with limited vegetation. This bare form of enclosure design may undermine the conceptual link that zoos are trying to establish between the animals in the zoo and their wild counterparts in habitats often far away and under threat.

The inclusion of such obviously artificial and human elements within enclosures militates against the benefits of naturalistic and immersive enclosure design- raising the risk of negative learning.

The following example is from Durrell Wildlife Park is the indoor enclosure for Sulawesi crested black macaques.

**Figure 31: Stark and Artificial Indoor Enclosure Design, Durrell Wildlife Park, Macaque Enclosure, 2010**

While the outdoor enclosure for these macaques completely different, visitors are likely to see the animals indoors a significant percentage of the time due to weather. As such indoor enclosures like this deserve greater attention in terms of making them more naturalistic.
A similar issue can be seen at the orangutan enclosure, where a highly naturalistic outdoor enclosure is set against the indoor orangutan enclosure at Durrell Wildlife Park, which comprises another prime example of unnatural elements within the enclosure design. In the case below, one of the orangutans has acquired a sack, which is being worn.

Figure 32: Stark and Artificial Indoor Enclosure Design, Durrell Wildlife Park, Indoor Orangutan Enclosure, 2010

The enclosure itself is unnatural in a way that does not support visitors’ ability to make the connection between the particular animals in captivity and the species’ existence in the wild.

More prosaically, the glass used in the indoor orangutan enclosure needed to have an anti-reflective coating added to it, or to have the lighting managed better as at times it was impossible to see the orangutans clearly and without distracting reflections (which break the reverie of feeling like one is close to the animals). The example below from Durrell Wildlife Park shows this kind of distracting reflection.
It is vital that zoos identify enclosure designs that maximise the feeling of closeness to the animals, which is a major reason for visiting and a crucial upstream contributor to zoo-based learning.

**Puns and Playful Phrasing**

There is a recurring pattern in zoo interpretation of using puns, allusions and metaphors, particularly in the headlines of signage and in the naming of exhibits. While there is nothing inherently wrong with employing playful language or puns within zoo interpretation, it is clear from the present study that these elements are often included without thinking through the implications for visitors' interpretations.

**Enclosures and Exhibits.** At a general level, the naming of enclosures and exhibits should clearly communicate to the visitor the animals they can expect to see. This is important both for managing visitors’ expectations and for helping to cement in visitors’ memories the species they have seen during their zoo visit. Thus, names of exhibits that employ creative or unfamiliar titles without a subtitle to clarify the intended meaning introduce the risk of confusing visitors and distracting them from potential educational impacts.

For example, the Orangutan exhibit in Chester Zoo is entitled ‘The Realm of the Red Ape’. Given that ‘red ape’ is not a well-known moniker for orang-utans, this label seems to introduce a distracting new name for this species with no obvious pedagogical justification. There is no evident benefit to this distracting exhibit name. Yet it unnecessarily introduces the possibility of confusing visitors and/or distracting them from a clear understanding of what species they have seen.

Other possible examples of this pattern include the Durrell Wildlife Park exhibit names such as ‘Jewels of the Forest’ (aviary), ‘Cloud Forest’ (features Andean bears, otters and
Rodrigues fruit bats) and ‘Kirindy Forest’ (features lemurs, XX and a second aviary). These ‘zone’ titles would seem to reflect the institution’s perception of the coherence of these zones much more than a priori visitor knowledge about what animals they might expect to encounter in these areas. In the case of ‘Jewels of the Forest’, the fact that this phrase is taken from the founder Gerald Durrell’s writing offers a potentially compelling metaphor for the birds that appear in this aviary. However, this phrase would seem to be more appropriate as a component of the aviary’s interpretation than as a stand alone description of the zone, which visitors are unlikely to decipher in advance. The unfortunate implication of this naming practice may be under-utilization of these zones.

**Signage and Interpretation.** At the level of individual information panels, the use of puns and playful language should also be assessed for its connotations and implications. The use of expressions which foster problematic entailments if one thinks through their connotations and implications is widespread within the zoos assessed for this study. In the following example from Durrell Wildlife Park, the sign says ‘have you seen this monkey?'

**Figure 34: Problematic Entailments in Informational Sign, Durrell Wildlife Park, Tamarin Enclosure, 2010**

![Figure 34: Problematic Entailments in Informational Sign, Durrell Wildlife Park, Tamarin Enclosure, 2010](image)

The normal use of the headline phrase (‘Have you seen this man?’) in the sign shown above is within the context of identifying and reporting known criminals, thus this headline could be seen as implicitly (if inadvertently) framing the images of the monkeys as ‘mug shots’. Other problems with this messaging include (1) the fact that since visibility is very poor at this enclosure many viewers will not have seen these monkeys and (2) the sign provides no information about the species as a whole, but instead focuses very narrowly on the particular tamarins living in captivity in Durrell Wildlife Park. In sum, this sign detracts from the core conservation messaging of Durrell and holds a significant risk of negative learning.

**Convoluted, Unnecessarily Complicated Approaches to Conservation Messaging**

It is important for conservation messages to be as clear and understandable as possible, with equally clear identification of what visitors should do with the information they
have been given. There is a pattern however of introducing additional layers of complication into a conservation message. The following example is aimed at teaching visitors about the problem of ‘coral bleaching’, however it does so in a way that is likely to confuse visitors. Namely, the display includes a white t-shirt and laundry powder boxes, which have a message about coral bleaching printed on them.

There is reason to question how understandable this message is. Indeed, the contribution to visitors’ understanding offered by this comparison to laundry detergent is unclear. The more likely outcome is confusion, although in practice this exhibit seemed to get very little attention from visitors (likely do to its placement away from the animals in the aquarium.

**Figure 35: Convoluted Conservation Messaging, Oceanografic, 2011**
Similarly confusing is a message printed on penguin shaped silhouette cut outs at ZSL London Zoo. In this example below, the attempt to deliver a climate change message is delivered in a way that promotes the unrealistic idea that penguins can migrate from Antarctica to the North Pole if necessary to avoid the ravages of climate change.

**Figure 36: Problematic content and framing of conservation and climate change messaging**

The further problem with this message is its placement on a lawn some distance away from the penguin enclosure. Moreover, the penguin collection at London Zoo is not comprised of cold weather Antarctic penguins, thus there are no ‘cold’ cues in the enclosure which has most recently been redeveloped and branded ‘Penguin Beach’.

**Figure 37: Potential habitat confusion - 'Penguin Beach' advertising**


Given the issues identified above, the coherence and clarity of the above penguin-related conservation and climate change messaging is highly questionable. This kind of confusion risks distorting the main point that the zoo would like to relate.

**Second Order Aspects of Engagement with Wildlife Conservation**

Delivering messages about conservation issues in a clear and relevant manner is vital for zoos seeking to go beyond the fundamental level of making scientific and conservation information available (first order) to actually engage visitors with key conservation issues and what they can do about these issues as consumers, voters and citizens (second order). Despite the importance of developing such engagement with visitors, only a minority of European zoos appear to go beyond merely providing information to advise visitors that there are actions they can take to help stem the tide of wildlife extinctions.
Communicating Biodiversity

While persuading publics that charismatic mammal species such as pandas are worth preserving may be relatively easy for zoo educators, the more fundamental message that it is important to preserve the full spectrum of biodiversity can be more challenging.

Invertebrates seem to be a particular challenge for zoos, which often frame such ‘creepy crawlies’ as frightening, disgusting or in other counter-productive ways. The following example shows a small insect-only zoo’s approach to making invertebrates interesting to visitors by touching them, see them and eating them:

Figure 38: Advertising Poster Outside of BugWorld in Liverpool, UK

The value of eating insects for enhancing appreciation for biodiversity is highly questionable, and may in fact result in negative impacts on visitors’ thinking about biodiversity and conservation.

The problematic framing of insects as ‘scary’ can also be seen in the souvenirs that are sold from this small insect-only zoo:
Empowering Visitors to take Action for Conservation

Given the goal of conservation education is ultimately to engender pro-conservation behaviour change, there is a strong theoretical argument for providing visitors with clear and relatable suggestions for what actions they can take to make a positive difference. This theoretical argument was tested empirically in a case study that was suggested and informally advised by Dr Eric Jensen in support of the present report, and conducted by Audrey Kim Ngeow for her master’s degree dissertation at the Institute of Education, University of London. The study followed a quasi-experimental design:

This study sought to find whether or not Rainforest Life has an impact on visitors’ awareness of issues in conservation. The info-graphics in the exhibit provide visitors with information regarding issues in conservation, and they are the starting point for this study. [...]

The info-graphics illustrate information regarding the human impact on deforestation with numbers and percentages. However, the graphics do not help visitors make the connection that individuals contribute to the equation and have an influence on the rates of deforestation. An intervention message card was introduced with hopes that it would either help visitors read the signs on a more personal level, or at least, if they did not look at the graphics, help them understand what they are seeing in the exhibit- the transported rainforest- brought to London in efforts to conserve the species found in the disappearing rainforests. Below, results from regular and intervention visits will be compared to determine whether or not there was a noticeable change in
the way the exhibit and info-graphics were read and understood with or without an intervention. (p. 25-26)\textsuperscript{12}

The results of this study showed that the provision of a specific pro-conservation action to visitors boosted the likelihood of positive visitor impacts, particular in terms of motivations to take pro-conservation action. These results are summarised below:

The data also shows that visitors, except for one, who were in possession of a message card brought up the issues of conservation on a personal motivational level, whereas the regular visitors were more likely to discuss conservation on an impersonal level, simply referring to facts they read on the info-graphics. While reading the info-graphics would help visitors understand that issues in conservation are the main message of the exhibit, simply reading the signs did not necessarily provoke the reader to consider their own role in conservation. The motivational outcomes that were directly related to conservation were those mentioned in the intervention visitors’ interviews. Furthermore, the message card changed the way the info-graphics were read, in that people discussed their personal commitment to conservation rather than simply reiterating the facts on the info-graphics. People were more likely to state a commitment to conservation when the message card was given to them, than if they had solely read the info-graphics. The message card helped readers further interpret the info-graphics so that they are provoked to take action, rather than memorizing facts. (p. 42)\textsuperscript{13}

*The full version of this London Zoo conservation action evaluation case study can be accessed through the following link:

http://www2.warwick.ac.uk/fac/soc/sociology/staff/academicstaff/jensen/ericjensen/kim_ngeow_report_on_clore_rainforest_life_enclosure_visitors.pdf

This section begins by identifying some examples of interpretation that directly address visitors to invite them to join the struggle to save wildlife through increased sustainability. Directly offering visitors suggestions in this manner is a vital component of building towards the most ambitious of zoo claims about their ability to reach visitors and change both attitudes and behaviour relating to conservation. The following is an example of good practice because it begins by clearly emphasising the core message that the individual visitor can ‘do something’ to make a difference, followed by specific suggestions of what they can do.


Despite its strengths, the information panel pictured above also has a few limitations. The first issue is that it only focuses on ‘wherever you are on holiday’ (assuming such a holiday will be overseas presumably given the suggestions offered). This suggests that there should be two separate panels for ‘whenever you are on holiday overseas’ and ‘when you are at home’. This is particularly important as a substantial percentage of visitors to this zoo may never go on overseas holidays.

Another important limitation to note is the vague recommendation at the bottom of the sign to report suspicious activities to ‘the authorities or to a local conservation organisation like SOCP’. The first part of this suggestion leaves the visitor unaware of who precisely to contact, therefore providing a single website of a conservation organisation that collects such reports might be more helpful. Secondly, the acronym ‘SOCP’ is provided without spelling out what these initials stand for. This is inherently problematic as it assumes a very high level of existing conservation organisation knowledge of the visitor. In essence, the advice offered to the visitor should offer clear, concise and realistic advice for actions that he or she can undertake to contribute to wildlife conservation goals.

**Conservation Fundraising and Public Engagement**

It is commonplace for zoos and aquaria to seek donations from visitors to support their wildlife conservation activities. A clear example of such a fundraising appeal can be seen in the following image:
While fundraising can be a useful way for visitors to participate in pro-conservation action collectively, it is important for zoos not to appear to be badgering visitors for donations at an excessive level. Indeed it is advisable to provide visitors with a range of possible ways they can contribute to the cause of protecting animal species from extinction, with donations to the zoo as only one option. This presents the zoo as an honest broker, committed first to wildlife conservation not consolidating economic resources.
A range of freestanding machines are used in European zoos to collect funds for conservation projects, while engaging visitors in different ways. A recurrent practice is for these machines to accept £1 / €1, and to provide in return a badge or other souvenir to take away with them. The value of this kind of activity is clear in terms of its economic contribution to zoos’ conservation projects. However, there is also potential for enhancing positive outcomes for visitors, who are able to take away a token of their visit, which may spark future conversations about their experience in the zoo when they return to the normal lives.

The example pictured above is of a coin stretching machine, which accepts €1 with an additional coin to be stretched and imprinted with one of three possible animals and some branding from the zoo.

While the kind of example seen above offers the two basic advantages of these kinds of machines (viz, bringing in conservation funds and giving visitors a token of their visit to take away), it is possible to make even better use of such a machine for public engagement with wildlife conservation.

The example of the ‘Hard Choices’ machine at ZSL London Zoo offers unusually authentic form of engagement with visitors, linked to fundraising.

This machine summarises the challenges of conservation for visitors, and offers them the opportunity to choose where they think their conservation donation would be most usefully targeted based on the information provided.

Although there are first order issues with the legibility of font and the excessive quantity of text on these panels, this is nevertheless a well-designed effort at
public engagement with wildlife conservation overall, allowing for direct conservation involvement on the part of the visitor while still within the zoo.

Visitors arrive at this funding machine after going past the linked interpretation panel pictured below.

**Figure 45: Preceding Interpretation linked to Integrated Engagement and Fundraising Machine, located at exit of Gorilla Enclosure, ZSL London, UK**

The final advantage of these machines is that they produce a small badge when the money is put into them, which can provide a longer-term reminder of the engagement experience at the zoo.

A similar machine is in operation at Chester Zoo, following the same pattern of presenting different choices from which the visitor can select for a donation:
The specific options on this machine include some targeting donations to the upkeep of the zoo and other options including ‘lobbying governments’.

Figure 47: Visitor Conservation Choices Machine Detail, Chester Zoo, 2011
The options also include overseas eco-tourism and conservation education programmes.

**Figure 48: Visitor Conservation Choices Machine Detail, Chester Zoo, 2011**

Finally, other options include general zoo donations and funding for park wardens to protect animals from poaching.
This approach offers multiple benefits, including fundraising, engagement with the complexity of wildlife conservation and upstream public engagement regarding the direction of the zoo’s conservation work.

The role of this kind of machine could be further enhanced by including a website or other source of further information on the badge or coin giving to the visitor, which would allow them to access further information or contribute further.

A similar model can be seen in the fundraising activity of National Zoo in the United States, which asks for donations to go to a specific purpose.
While this example is not conservation-related, it nevertheless demonstrates the general principle of maintaining transparency and openness with zoo supporters about what their funds will be used for.

Managing Multiple Meanings of Objects in Object-based Learning and Engagement

Visual imagery is inherently polysemic. That is, it is subject to multiple possible interpretations. For example, a child seeing a tiger cub or a parrot in a zoo might if left unguided conclude that he or she would very much like such an animal as a pet. This would be a negative outcome, but it is entirely possible without specific guidance aimed at directing the interpretation of the visual experience of seeing these live animals. Directing the experience can take a number of forms, with the most common across European zoos being the use of fixed signage communicating legally required scientific information about the animal species name, the geographical location of its natural habitat and its endangered or non-endangered status. Some zoos go beyond this

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14 This screenshot comes from the National Zoo website, specifically from this weblink: [https://salsa.democracyinaction.org/o/1483/t/3613/shop/custom.jsp?donate_page_KEY=6822](https://salsa.democracyinaction.org/o/1483/t/3613/shop/custom.jsp?donate_page_KEY=6822).
required information to provide further details about the specific species, its natural habitat and relevant conservation issues.

**Animal Shows and Educational Presentations**

Animal shows and educational presentations are commonplace in EU zoos. From a conservation education standpoint, both of these engagement genres tend to focus on connecting visitors viewing of live animals with conservation or at least animal biology related messages. Of course there is a great deal of variability in the content and formats of these educational shows and presentations. Some zoos such as Chester Zoo and Durrell Wildlife Park only offer educational presentations (located near the animal enclosures that correspond to the topic of the presentations). Other zoos offer more entertainment-oriented animal shows.

While there is no rigorous research on the relative positive or negative impacts of these two different approaches. There are some *prima facie* strengths and weakness of the different approaches.

![Figure 51: Pirate-themed dolphin show at Kolmarden Zoo, Sweden, 2011](image)

Entertainment-oriented shows featuring trained animal performances have the advantage of being generally popular with visitors in terms attendance figures and maintaining a high level of attention. However, the messages that visitors take away from the viewing experience for such shows may not be as intended. In the drive to be entertaining, confusing elements can enter into such animal shows, which can detract from educational or engagement messages embedded in the show. In the pictured example, a pirate narrative is adopted in the dolphin show and the show is narrated by people in pirate costumes with accompanying music and set pieces.

For many entertainment-oriented animal shows, there is also a risk of anthropomorphising and encouraging unrealistic and unnatural understandings of animal behaviour. Some of these risks are summarised based on the ethnographic research conducted at two UK zoos by Elliot (2006):

> Naturalism may be contradicted by another form of representation in zoos that I will only mention in passing, and that builds on a much older tradition of zoo-keeping, one that is in some respects closer to the circus: the staging of animal shows. Such shows tend to be explicitly designed to elicit what I describe as a circuit of anthropomorphism [...]. In such
shows, visitors are invited to “humanize” the animals insofar as the animals are given human names and are made to perform quasi-human practices – for example, the Paignton Zoo has a show in which a parrot finds an object that has been concealed and shuffled beneath three different cups. (Elliot 2006, p. 214)

This risk of negative impacts should be investigated empirically but at present it is unknown whether and to what extent zoo shows feature trained animals result in positive or negative impacts.

Conversely, educational presentations that simply take place near animal enclosures with no show elements run the risk of having lower visitor interest and attention. This could mean that such presentations are overall less effective than the entertainment-oriented shows, but again this is currently unknown.

*Ambiguous or potentially learning-negative objects*

It is routine in zoo-based conservation education for animal skeletons, shells, teeth or skins to be used with the aim of engaging visitors. For example, the following example from Zagreb Zoo features part of an elephant skeleton alongside an interpretation panel focusing on the conservation problem of poaching:

**Figure 52: Elephant skeleton and poaching interpretation panel**

![Elephant skeleton and poaching interpretation panel](http://www.zoolex.org/zoolexcgi/viewpicture.py?id=1121&pic=16)

© Monika Fiby, 2008
Some artefacts or objects or specimens used to communicate scientific or conservation messages could be seen as particularly open to problematic interpretations if they are received by visitors without any educational intervention. Notably, the use of animal skins and skeletons fall into this category of objects, which spark potentially problematic thoughts in visitors’ minds. This issue is particularly salient for children who often assume that an animal has been killed by the zoo if they see these objects.

The following photograph shows skins and the head of an animal skeleton being used in zoo-based public engagement, crucially with an education officer managing the interaction and thereby influencing the ways in which these artefacts are interpreted.

**Figure 53: Potentially Learning-Negative Objects, Kolmarden Wildlife Park, Temporary Engagement Point near Tiger Education Shack, 2010**

Specifically, this Kolmarden education officer is able to direct the understanding of these objects towards pro-conservation messages and away from distracting thoughts about the zoo’s role in obtaining these artefacts. An important additional point in this context is that animal skins and animal-derived consumer goods which have been seized by customs and donated to zoos can serve a useful educational function in showing some of the causes of conservation problems facing animals. However, the display of these objects should be interpreted for visitors in order to limit problematic interpretations along the lines of ‘I would like to have a handbag like that’.
The only research currently available on the topic of using animal skins and other ‘biofacts’ within zoo education comes from an unpublished evaluation report produced for London Zoo by Dr Eric Jensen, which presents the results of focus group research. The relevant section of this report is extracted below.

**Case Study: Using Animal Skins, Skulls, Bones and Related Animal Artefacts in Zoo Education**

One key component of zoo education that the focus group data shed some light upon is the use of animal skins, skulls, bones and related artefacts what ZSL formal learning officers call ‘biofacts’. These artefacts are generally on loan to the zoo from UK Customs, which has seized them as part of illegal trade and smuggling of animal products from protected species into the UK. These specimens are used by the zoo educators at ZSL for a variety of teaching purposes. A key function they serve is fostering interactivity in sessions as pupils are able to stroke or handle these artefacts. ZSL FL team members see these objects as useful tools for facilitating pupils’ learning and they are believed to be ‘effective’ because they seem to capture pupils’ attention.

In interview research conducted concurrently and immediately following the use of these artefacts, the quality of learning that was emerging was evaluated through discussion with pupils. The overall conclusion of this thread within the present research is that animal artefacts should only be used in educational presentations whose content is directly linked to the artefacts used. When used for non-specific purposes such as enhancing interactivity with no content link there is a real risk of negative learning for pupils due to the potentially problematic thoughts that viewing what appear to be dead animals in the custody of zoo educators.

**Positive Outcomes from Content-Linked Artefacts**

The ZSL Formal Learning presentation entitled “Hands on” is specifically focussed around touching various animal skins, with the conceptual learning aims centring around an understanding that different animals have different kinds of skin or fur or hair.

Indeed, as can be seen in the focus group extract below, this aim was successfully achieved in this example.

**Int** Did you like [the educational presentation]?

**Child1** Yes

---

What did you like about it? What was good about it?

Feeling...

Feeling the skins? Did everybody like feeling the different skins?

Yes.

What did you learn about the skins? Is there anything you didn’t know before? Are there different kinds of skins?

Yes.

What kinds are there?

Some are hard.

Some are smooth.

And what kind of skin do you have? What kind are you?

Hairy.

**Negative Learning**

Jensen (2011) found that in a minority of case (just under 13%), pupils’ annotated drawings evinced a negative change from the pre- to the post-visit data collection points. These negative changes took three forms: Knowledge decrement, knowledge conflation and representations of animals in captivity. These negative developments in pupils’ thinking are important for zoo educators to understand in order to develop pedagogical mechanisms for counteracting their emergence. Amongst pupils visiting the zoo, these negative changes were much more prevalent amongst self-guided visits than for visits supplemented by an educational presentation, a pattern which was investigated further using the pupil focus groups. The research question addressed by this aspect of the focus group research is: Why does negative learning occur for pupils on unguided visits around the zoo?

Jensen (Jensen, 2010) argued that the results of the pupil survey aligned with the general principle development of human knowledge is always cumulative. As such, new ideas sparked by observations at the zoo must be integrated with existing ideas in pupils’ minds. It is possible for this process to completely displace certain misconceptions about animals and their habitats, as seen in the ‘positive change’ examples. However, if the scaffolding for guiding children’s interpretation of new stimuli encountered at the zoo is insufficient, then it is not surprising that problematic patterns of learning would occur. That is, pupils that have not
been equipped with the relevant conceptual tools for making sense of stimuli within the zoo will be more likely to evince sub-optimal or negative learning outcomes. This conclusion from the pupil survey is further investigated through the focus group data to more fully understand the relationship between inadequate guidance on problematic learning outcomes.

**Pupil Focus Group Results – The Need for Scaffolding**

Pupils encounter a range of stimuli at the zoo. How equipped they are to interpret these stimuli depends very much on their existing knowledge and conceptual tools. For children growing up in deprived inner city London, many of the conceptual resources needed to get the most out of a zoo visit may not be available. The consequences of this social fact can be seen in the following extract, which begins in a promising way by showing that a pupil was able to draw upon existing observational skills to develop her knowledge of biodiversity. Specifically, she learned that tortoises can become much larger than she had previously imagined after seeing Galapagos tortoises at ZSL London Zoo.

F12  I've never seen a turtle bigger than my hand before.

Int  So, you were surprised at how big it was?

F12  Yes. And it was moving and it was massive! I thought it was a rock at first, and then I realised.

Int  So, why did it get so big, do you know?

F12  Because it's greedy.

F11  I never read about it.

F12  Because it's greedy. [...] 

*Self-guided Zoo Visit; Female Pupils - Age 13*

As can be seen in the extract above, the pupil attributed the tortoises’ surprisingly large size too over-eating (i.e. the Galapagos tortoise was viewed as 'fat' and gluttonous). This exemplifies the pattern identified in Jensen's (2011) analysis of the patterns for self-guided learning at the zoo. Autonomous self-guided learning can reach a certain point without intervention (in this case it reached the point of learning that tortoises can be much larger than the pupil previously thought), but scientific explanations about 'how', 'why' and 'in what context' this gigantism develops requires educational intervention. While there are information panels around this recently created exhibit, the child has clearly not
accessed this information and is therefore left to create her own explanation on the basis of her prior experience and cultural knowledge about how humans come to be larger in size.

A similar pattern of applying existing cultural knowledge to interpret the objective experience of seeing animals in the zoo can be seen as the extract continues below. In response to a question from the interviewer about the habitats for these large tortoises, the pupils begin to speculate:

F12 It’s from Africa or America, somewhere like that.

F11 No, it can’t be from Africa. That would make it skinny.

_Self-guided Zoo Visit; Female Pupils - Age 13_

The first response suggests that the pupil ascertained that these animals’ wild habitat must be far away from Britain, and indicated a couple of such distant places. However, the second pupil’s responses evidence a deeper pattern of interpretation. She applies her existing cultural knowledge of Africa as a place where ‘skinny’ people live to the tortoises, concluding that these animals cannot be from Africa because they are far from ‘skinny’.

This pattern of children interpreting animal phenomena encountered at the zoo in ways that draw upon existing knowledge about human contexts can also be seen in the following extract from a different school.

Int Sounds like you’ve seen quite a few animals already.

F1 We saw the fish and the gorillas.

Int Fish and the gorillas. What did you think of the gorillas?

F2 They were very fat.

Int Fat, oh. Why do you think they’re fat?

F2 Because they’re big. […]

Int Did you notice anything else about them?

M1 They’re hairy.

Int They’re hairy, why do you think they’re hairy?

M1 Because they never shave.

_Education officer-led visit (pre-presentation) – Age 10_
This extract above further evinces the pattern of pupils interpreting the characteristics of animals through the lens of their existing knowledge of human patterns. This is an important finding for understanding the ways in which children approach potential learning opportunities in zoos when there is no educational intervention.

Although not strictly ‘negative’ learning, the following extract shows the need for educational intervention or guidance to develop a basic observation such as the presence of flies at the zoo into a more sophisticated scientific understanding, for example, of the relationship between insects such as flies and larger animals such as giraffes.

Int What do you think about when you are walking around the zoo?

F8 I think of flies for some reason. [...] Flies and little things.

*Self-guided Zoo Visit; Female Pupils - Age 13*

Indeed, the kind of thoughts reported above could be developed into positive learning with the right support. Or, if left undeveloped such thoughts could shift towards a negative perception of the zoo as a dirty place, for example.

*Problematic Patterns in Self-Guided Visits: Touristic Behaviour*

One way of approaching the zoo visit that does not evidence positive development is the pupil-as-tourist profile. As can be seen in the following extract, this involves documenting one’s proximity to particular animals.

Int Have you learned anything about animals, where they live, that kind of thing?

F12 Yeah, if you read that purple thing or that square thing [points to information panels]. I just took pictures of me and- pictures like that. [Laughs, holding up a digital camera image]. Myself and the animals.

*Self-guided Zoo Visit; Female Pupils - Age 13*

This extract above indicates that the pupil knows where to find information about the animals in the zoo if she was interested to do so. However, her actual actions have centred upon taking photographs of herself with the animals. While it is possible that this kind of behaviour could result in greater interest in the photographed animals and later result in the pupil seeking out further information about them, this egocentric approach to the zoo visit does not show any immediate positive development in the pupils’ thinking about animals and habitats.
Problems Patterns from Presentations with Live Animals

It was clear that pupils responded very positively to live animals that played a key role in outreach presentations in schools. However, the question of whether they were actually learning from these presentations is more complicated. The extract below evinces a pattern of indicating satisfaction with the outreach presentation, but then the self-reported ‘learning’ taking a problematic form (in this case, the presentation engendered an interest in possessing the animals they saw as pets).

Int Hello, can I ask you about what you thought of that session? What did you think? Did you like it?

M1 Yes.

Int What did you like about it?

M1 I liked all of the animals. I liked the snake, the parrot.

M2 I liked the snake and the parrot.

M1 I liked all of the animals.

Int And what did you... did you feel that you learned anything?

M1 Yes, I wished I had a snake and a parrot and what are these things called again?

Int A ferret.

Zoo Outreach Visit – Reception (Age 4-5)

This outcome of having an increased interest in owning these animals as pets cannot be viewed as a positive pro-conservation outcome for respondent M1. This indicates one possible interpretation pupils may come to when encountering live animals (desirability for pet ownership).

A similarly problematic interpretation can be seen in the following extract, which highlights that the ‘show’ aspects of live animal presentations can be distracting for pupils’ learning. In this case, the parrot participating in this educational presentation has been trained to “say hello” and to “wave” to the class. It is important for zoo education to present these animals in a way that forestalls such an interpretation to the degree possible in the interest of promoting pro-conservation outcomes.

Int And what did you... did you learn anything about the parrot? Did you find out anything new about the parrot?

M1 Yes, because I liked it when it said “hello”.
This problematic pattern can also be seen in the comments by another child during this outreach visit.

Int Did you learn anything else about the snake?

M2 Yes, well I liked the parrot. I didn’t know that parrots can actually talk. I didn’t really know that and it can wave but I didn’t really know that.

In the focus group extract above, it is indicated that the child’s ‘learning’ was the problematic conclusion that parrots “can talk”.

The problem of children attending to unnatural aspects of animals’ appearance in their classroom during a zoo outreach visit can also be seen with reference to the ferret in the following extract:

Int What was special about the ferret? What do you remember about it?

M2 I remember about the [carrying] case [for the ferret]. They have a special case.

M1 I like how [the ferret] pulls in the biscuits. I liked it how he was pulling in the biscuits and how he found them all. I really liked it.

In the extracts above, the focus is on distracting unnatural elements of the animal’s visit, rather than on core messages being communicated by zoo educators.

The extracts above suggest that some aspects of live animal shows may be counter-pedagogical as the unnatural elements are highly memorable.

Windows on ‘Behind the Scenes’ Activity

A direction for public engagement with conservation that is less open to negative interpretations but nevertheless holds some ambiguity if guidance is insufficient is the provision of ‘windows’ into the conservation breeding activities of a zoo. The appearance of an artificial, medical and/or laboratory environment could spark a negative reaction in the absence of a full understanding of the broader significance of such conservation breeding. The following example offers straightforward messages about the breeding activities that take place in the pictured bird breeding space.
However, even these messages might be insufficient for ensuring that the significance of what visitors see is understood, and forestalling any problematic interpretations of this.

**Institution-Centric Conservation Messaging and Narratives**

The ways in which conservation messages are communicated requires careful thought and calibration in order to make distant problems in far off places feel relevant to zoo visitors' lives. Messages by zoos and aquaria which focus exclusively on their own organisation and its conservation action run the risk of disempowering visitors by not acknowledging the role for individuals in contributing to conserving wildlife through daily action. A more effective approach to engaging publics with a given zoo's conservation efforts is to frame these within a larger spectrum of pro-conservation action, which builds from the level of the individual to coordinated group action to institutions such as zoos acting to focus collective pro-conservation action through careful designed programmes targeted at the most urgent conservation issues.

At its most institution-centric, conservation messaging completely centres on what the institution values and finds to be of interest without regard for what most visitors will find interesting and intelligible.

Some of Durrell's messaging offers some indication of encouraging visitor empowerment, however, the visitor's conservation action is circumscribed in this messaging by the need for it always to be mediated through institutions such as Durrell.

The following example from the Durrell website offers an example of this pattern.
This campaign also had a presence in Durrell Wildlife Park, as can be seen in the following posters that appear close to the park’s entrance.

It is noteworthy that these posters did not appear near where the associated live animals reside in the park. Moreover, the posters seem to presume (without basis) the park visitor will know that these animals have been the focus of Durrell conservation activities over the previous fifty years- and are not simply randomly selected animals.
The problem of failing to make the connections explicit for visitors can also be seen in the following example in Durrell Wildlife Park. This example provides a completely de-contextualised piece of information, which is very likely to leave most visitors mystified as to the significance, timing or implications of the information.

Figure 58: Action-oriented but De-Contextualised Messaging, Durrell Wildlife Conservation Trust Website, 2011
Another potentially positive example of conservation messaging that ultimately falls short appears in Durrell Wildlife Park. It identifies a specific project addressing the need for ecological connectivity for black lion tamarins.

Figure 59: Potentially Flawed Individual Action-oriented Messaging, Durrell Wildlife Park, Black Lion Tamarin Enclosure, 2010

However, the information panel pictured above fails to connect this project to the lives of the individual visitors reading the signs. Should the visitor provide their aluminium cans to Durrell to recycle? Or are only Brazilians who can participate in this conservation programme? The visitor is left unsure about his or her own potential role in supporting this project. Moreover, the tamarin pictured in the centre of the information panel is shown on a rope, rather than in its natural environment, which undermines the larger conservation education goal of enhancing understanding of the links between animals and the habitats that conservationists work to protect.

Low Technology Alternatives to Fixed-Sign Interpretation

The conventional fixed sign-based approach to zoo interpretation has been questioned on the basis of the limited usage levels of such signs. As such, other approaches to achieving similar aims of educational provision should be considered. Possibilities in this vein include audio guides, informational leaflets that visitors take away with them, electronic options triggered by text messages or visits to a website, video, touch screens and interpretation that visitors carry with them.

The following example from Durrell Wildlife Park’s aviary offers one simple possibility for achieving this (potentially at a lower initial cost than producing a sign and with greater take up from visitors). This approach has the advantage of not being subject to
being obscured by other visitors, as well as ensuring that the visitor has the information available regardless of where they happen to be in the enclosure when the encounter the animals (this circumvents the enclosure design dilemma of deciding where the information will be placed within the enclosure).

Figure 60: ‘Low Tech’ Ambulatory Messaging, Durrell Wildlife Park, Jewels of the Forest Aviary, 2010

Problematic Patterns in Fixed Sign-based Zoo Interpretation

Interactive signs
In many zoos an interest in introducing ‘interactive’ signs has resulted in the addition of relatively expensive but simple adaptations to the conventional sign such as the use of ‘flaps’, which raise to reveal an answer. The utility of these ‘interactives’ is questionable, given that they generally are the same as normal fixed sign-based interpretation, but requiring manual manipulation in order to access the information.
While it is possible that such an approach could yield better outcomes, no evidence of this currently exists. Observations of children using such ‘interactives’ suggests they do not tend to use them as intended by the zoo educators who created the signs.

Overall, there should be a fundamental assessment of what is meant by the term ‘interactive’ and whether simply adding flaps to a conventional sign really constitutes interactivity.
Invasive Species Messaging

One of the more complicated conservation issues to explain to visitors is the potentially pernicious role invasive species. The idea that non-native species can come to displace and ultimately drive to extinction native species does require some explanation and finding ways to boil down such an explanation for use in a zoo is a challenge. Below, some examples of attempts to tackle this difficult conservation topic are considered. Ultimately better means of communicating this idea are still needed. One important direction for developing this form of conservation messaging is to emphasise the ways in which this is relevant to visitors, for example, suggesting they try to avoid introducing non-native species. Also, providing an example of an extinction that occurred due to invasive species within the country the zoo is based could be a useful way of communicating this message.

Chester Zoo Case: Invasive Species Case ‘Islands in Danger’

Essentially, this story is that giant land snails were introduced for food into a new habitat. Numbers got too great so they introduced a predatory snail to reduce giant snail numbers, but the predatory snail just ate the native Partula snails instead.

Figure 63: Invasive Species Messaging, Snail, Chester Zoo, UK, 2011

Image courtesy of Andrew Moss, Chester Zoo
It is worth noting that this expansive approach to telling a conservation story is unrealistic for the context of casual visits to the zoo. It is obvious that a more lively form of storytelling is called for, and if signs are to be used as the medium, then the message needs to be pared down to the bare essentials.
Challenges in Invasive Species Messaging

The attempt to communicate a negative message about an animal in the zoo collection raises a number of difficulties. In the following example of the cane frog display at Durrell Wildlife Park, some of these problems come into sharp relief.

Figure 66: Invasive Species Messaging, Durrell Wildlife Park, Reptile & Amphibian House, Cane Toad Enclosure, 2010
Figure 67: Invasive Species Messaging, Durrell Wildlife Park, Reptile & Amphibian House, Cane Toad Enclosure, 2010

This messaging sits uneasily alongside the display of the live animal itself (see below).

Figure 68: Durrell Wildlife Park, Reptile & Amphibian House, Cane Toad Enclosure, 2010

Potentially Disturbing Conservation Messaging

The use of graphic violent imagery to confront visitors with problems of hunting and animal products only appears in a minority of zoos and aquaria. However, when used this sort of imagery raises the stakes significantly in terms of increasing the likelihood that the signage will have an emotional impact and also that the sign will be interpreted in problematic ways or will upset visitors without a clear benefit. The use of violent and otherwise potentially distressing imagery in zoo interpretation must be done with
careful thought and designed to focus the interpretations that visitors might take from such imagery.

As with the use of animal skins and skeletons, employing such imagery is most advisable when zoo staff are present to answer questions and otherwise provide guidance and context about what is being communicated through such imagery.

However, given the unproven value of this kind of stark imagery, it may not be advisable except in rare circumstances when the proven benefits outweigh the risks of its use.

Figure 70: Violent Photo, Interpretation Panel, Bear enclosure, Skansen (Stockholm Zoo), 2010
General Recommendations

This critical review of public engagement materials developed by zoos and aquaria to enhance pro-conservation outcomes for visitors shows that there are a wide range of efforts to this end across Europe. However, the specific methods and techniques of engagement are often flawed or ill-conceived. The wealth of relevant knowledge about communication and psychology does not seem to have been applied in most cases, limiting the likelihood of positive impact at both first order and second order levels. At a first order level, restricted animal visibility, poorly designed information panels and other basic issues undermine the possibility of conservation messages even reaching visitors or of animals having an affective impact that enhances such messages. At the level of message content (second order), there are questions to be raised about the most effective ways of engaging visitors with wildlife conservation. This review argues that many second order practices currently in place are *prima facie* flawed, or may even be counter-productive.

Media Representations and Zoo-based Conservation Education

At present, zoo interpretation does not show much engagement with the wider culture in which visitors are embedded. In particular cultural representations of animals are key starting points for many visitors’ understanding of animals prior to visiting the zoo and will continue to be influential post-visit. Rather than seeing zoo education as in opposition to mediated forms of learning about nature, zoos should consider ways in which they can work in complementary ways with animal representations. In this way zoos can harness the ubiquitous appeal of mass media by seeking to develop existing social representations in the direction of pro-conservation messaging. For example, a beloved cartoon character can be used as the starting point to establish interest. An aquarium might use a particular fish character from the film *Finding Nemo* as a starting point, and then focus on where this fish actually lives in the wild and what their habitat is like. This can also work with children’s books about animals.

For older audiences, nature documentaries can be used sparingly but effectively within the zoo experience to show aspects of animal behaviour or conservation related concerns that are unlikely to be visible within the time and space horizon of the visit. In this case, viewing the animal is likely to be the initial stimulus in terms of fostering curiosity and then the documentary can enhance the visitors’ knowledge about this animal, their habitat and relevant conservation concerns.

Better Methods for Understanding Zoo Educational Impact

Currently, there is a heavily reliance in zoos on methods employed within museums. Unfortunately, these museum visitor studies methods are often flawed to begin with and are made worse through their uncritical application to the zoo context (e.g., Dawson & Jensen, in press). There is however an important place for structured observation studies (known within museum studies as ‘visitor tracking’) to identify patterns of public engagement in zoos and aquaria at the first order level. That is, observational
studies should be able to identify if there are fundamental problems of dis- or under-use of particular engagement materials, information panels or activities. However, purely observational studies cannot validly extend their claims (as some researchers have attempted) beyond the bounds of first order aspects of public engagement. To assess the effectiveness of second order engagement requires social scientific methods of data collection such as surveys, focus groups, semi-structured qualitative interviews or recordings, which are analysed following a rigorous approach. Notably, it is this second order aspect of engagement that lends itself to assessments of longitudinal impact.
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References


