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COMMENTARY

The Educational Claims of Zoos: Where Do We Go from Here?

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Zoos exude a certain self-confidence regarding their roles as education providers. Indeed, the education outputs of zoos are, at face value, pretty impressive, with most investing in learning opportunities for leisure visitors, education groups and in some cases, as part of their in situ programs. However, these outputs are not necessarily reliable indicators of the educational achievements of zoos. Quantity does not necessarily equate to quality, just as outputs do not necessarily lead to outcomes. Zoo-accreditation organizations such as the AZA and EAZA offer us clear insight into the strategic vision underpinning the education goals for zoo visitors; a heightened appreciation of the value of biodiversity and a connectedness with the natural world. Unsurprisingly, most zoos have educational goals that ally neatly with the vision of their respective accreditation body. Consequently, we are left with fairly narrow, top-down educational goals. This does not necessarily sit well with what we know about the unpredictability of "free choice" learning in environments such as zoos and aquariums, or what is known about public science communication. Research that seeks to explore the impacts of zoo visits often focuses on evaluating performance based on educational goals and the findings are used as a means of providing evidence of institutional achievement. However, any visitor outcome that falls outside of this narrow range could well be missed by the research. In this article, we propose that research that takes unpredictable and unexpected outcomes into account is necessary and overdue. Zoo Biol. 32:13–18, 2013.

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ZOOS AND EDUCATIONAL ASPIRATIONS

Traditionally, zoos have offered formal, educator-led teaching to school and college groups [Anderson, 2003] and this has continued, with most zoos [In this article, "zoos" refers to those within the established zoo accreditation framework; we do recognize that there are many zoos that fall outside of this] continuing to offer curriculum-linked packages of teaching across the age groups. Other outputs in the form of educational materials and activities have are also part of the zoo's educational repertoire; for example, signage and interactive interpretation [Fraser et al., 2009], public talks at animal exhibits [Moss et al., 2010], informal educator interventions via staff or docents [Mony and Heimlich, 2008], and animal demonstrations [Povey and Rios, 2002]. The generally accepted way of referring to the different educational outputs of zoos is to separate them into two categories; formal (taught, educator led, not necessarily self-selected) and informal (visitor led—interpretation, talks, demonstrations, etc.). For the purposes of this paper, we use the word "education" to refer to all zoo educational outputs. This diversified approach to educational outputs would seem well capable of accommodating differing learning styles [cf. Gardner, 1985] and previsit agendas [cf. Falk et al., 1998]. The important question however is what drives the content of all these educational outputs.

ZOO ACCREDITATION

At a strategic level, zoo accreditation bodies state clear educational goals. Table 1 summarizes these for the major worldwide organizations.

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TABLE 1. The Educational Goals of the Major Zoo Accreditation Organizations

Zoo Accreditation Organization	Education goals
World Zoo and Aquarium Conservation Strategy (2005). WAZA	"The educational role is to interpret living collections to attract, inspire and enable people from all walks of life to act positively for Conservation."
	"The educational role of zoos and aquariums will be socially, environmentally and culturally relevant, and by influencing people's behavior and values, education will be seen as an important conservation activity."
Association of Zoos and Aquariums (US)	"Facilitate multi-institutional conservation education, outreach, and collaborations that activate the public to connect with and take personal action to conserve wildlife and wild habitats."
Zoo and Aquarium Association (Australia, New Zealand and the South Pacific)	"To provide exemplary learning opportunities that connect people with nature. These experiences enable the community to better understand and contribute to a future where humans live in balance with the natural world."
European Association of Zoos and Aquaria	"To create an urgent awareness among the many millions of European zoo visitors of the fact that the long-term survival of a thriving human population on earth is fully dependent on the rapid development of sustainability on a global scale. And, through the creation of this awareness, to evoke individual and collective political action aiming at reaching global sustainable levels of all human activities within the next three to five decades."
African Association of Zoos and Aquaria	"The education message should be well defined and holistically presented in terms of the integrated conservation approach of the institution."
South East Asian Zoos Association	"The vision of the South East Asian Zoos Association is that its member zoos utilize their animal collections for the primary purposes of educating our public by imparting messages on the urgent need for environmental conservation in a manner that upholds the respect and dignity of the wild animal."
British and Irish Association of Zoos and Aquariums	"BIAZA collections aim to provide unique lifelong learning opportunities, to raise awareness, to increase respect and knowledge about wildlife and global issues, and thus to engage and connect people of all ages with the natural world."

We argue here, that there are strong similarities between the educational goals of the accreditation organizations in Table 1, particularly in the use of aspirational and emotive language. For the major zoo accreditation organizations, the most universally relevant of these educational goals are arguably those taken from the World Zoo and Aquarium Conservation Strategy [WAZA, 2005]. This is the overarching strategic document for zoos worldwide, so we would expect regional and national zoo-accreditation organizations to ally with this position Here, we find that education should not only "be seen as an important conservation activity," but it also should have an "action" component, resulting in zoo visitors being inspired "to act positively for conservation." To zoo critics the use of aspirational and emotive language could suggest that either these goals are yet to be met or there is a lack of evidence to support stronger, more outcome-orientated statements.

In addition to these strategic, aspirational goals for zoo education, accreditation organizations exude, via their public websites, a self-confidence regarding their educational value. For example, the Association of Zoos and Aquariums (AZA), on its main education web-page, states that "AZA-accredited zoos and aquariums play a vital role in educating over 175 million visitors, and 12 million students in the classroom or in the field, about wild animals, their habitats, their related conservation issues, and the ways in which they can contribute to their preservation" [AZA, 2011]. As this figure of 175 million equates to all annual visitors to AZA zoos, this is clearly suggesting that every visitor is being educated according to the AZA's vision. And, presumably, this quoted figure includes visitors that have visited more than one zoo, or have visited the same zoo a number of times. This is the reporting of an educational outcome that must have an evidential base to be valid. The British and Irish Association of Zoos and Aquariums (BIAZA), again on their main education web page, state that "Enthusiasm about animals is infectious and zoo visitors are highly 'susceptible' to education" [BIAZA, 2011]. These are two confident statements, neither of which is obviously supported in the literature concerned with zoo visitors. Additionally, the terms "enthusiasm" and "susceptible" are difficult to define in this context and would as a consequence, be difficult to measure. The Zoo and Aquarium Association (ZAA), on their "role of zoos and aquariums" web-page state that zoos "uniquely have a massive 'captive audience' of visitors whose knowledge, understanding, attitude, behavior, and involvement can all be positively influenced and harnessed" [ZAA,]. Again, this is a confident statement that all zoo visitors can be influenced positively for the benefit of conservation.

EDUCATIONAL GOALS OF MEMBER ZOOS

Patrick et al. [2007] undertook a more comprehensive analysis of zoo mission statements (in the United States) and found that the theme of education was mentioned in

131 out of the 136 mission statements analyzed. In fact, education appeared more frequently than the theme of conservation (118 out of 136 statements). Clearly, education is seen by zoos as core to their respective missions. When we look in detail at individual zoos, of which about 1,000 fall within the zoo accreditation framework of WAZA [WAZA, 2005], we find a more mixed picture. Superficially, zoos appear to be saying the same thing but differences in written emphasis, regarding their educational value, have created a situation where some zoos are making very strong claims; others are more reserved.

For example, the Chicago Zoological Society states that they "create multiple opportunities for visitors of all ages and backgrounds to have meaningful experiences at the zoo. We invite you to feel connected, committed, and curious in our wild classroom" [CZS, 2011]. This clearly tells us that learning opportunities are available and how the zoo would like visitors to experience them, but stops short of claiming that visitors are having "meaningful" experiences or do feel "connected, committed and curious" as a result of their visit. The National Zoo, however, are more confident, stating that they "educate and inspire diverse communities so they become part of our commitment to celebrate, study, and protect animals and their habitats" [National Zoo, 2011]. Wildlife Reserves Singapore also present a more causal claim, stating that their "Living Classrooms" program "takes everyone on a learning journey that highlights the interdependency of nature's inhabitants and the significance of appreciating them" [WRS, 2011]. Melbourne Zoo states that "A visit to our zoo is an exhilarating journey of exploration and discovery that will galvanize action for wildlife in wild places" [Zoos Victoria, 2011]. Chester Zoo claims that it provides "a memorable and stimulating learning experience for everyone" [Chester Zoo, 2012]. These examples do not claim to be representative of zoos' educational goals. We merely seek to highlight the potential issue of overexaggerating claims for educational impact.

This leads us to believe that there is some blurring of the distinction between educational aspiration and outputs, the resources designed to deliver that aspiration and measurable educational outcomes (that result in conservation impact). It appears that there is, in some cases, a false perception; that by simply "aspiring to" or "providing" somehow leads directly and linearly to "achieving" the aspired-to outcomes. We argue that by making claims such as those quoted above, zoo organizations and zoos leave themselves open to external criticism of their claims as education providers. One high profile example from the United Kingdom comes from a well-researched report produced by the Royal Society for the Prevention of Cruelty to Animals (RSPCA) in 2006. The work conducted a literature review into the educational effectiveness of zoos and found virtually no peer-reviewed studies relating to zoos in the United Kingdom. The small amount of research uncovered was inconclusive with regard to the educational value of zoos, and the report concludes that "it is not enough for zoos to aim to have an educational impact, they should demonstrate a substantial impact. From our review of the literature, this does not yet appear to be the case" [RSPCA, 2006 p.97]. In direct response to this report, Esson [2009] stated that "Zoos are increasingly finding themselves lodged between a rock and a hard place when it comes to substantiating claims to be education providers" (p.1) and warned that zoos "need to carefully consider education policy and the claims we make as education providers" (p.2).

Unfortunately, for zoos, this criticism has not only been constrained to a lack of research into zoo educational impact, but has also been directed at published research itself. The widely publicized, multi-institution study (where the AZA was a supporting partner) "Why Zoos and Aquariums Matter" [Falk et al., 2007] has prompted some peer-reviewed criticism. Marino et al. [2010] discuss various methodological issues associated with the work, but the main reason that these issues are raised at all is because of the strong causal claims made by Falk et al. [2007] regarding the direct positive impact zoos have on their visitors. For example, Falk et al. [2007] state in the executive summary that "Our visitor impact study shows that zoos and aquariums are enhancing public understanding of wildlife and the conservation of the places animals live" (p.4). This is clearly a causal claim, with which Marino et al. [2010] take umbrage on methodological grounds, concluding that "Nevertheless, despite the widespread acceptance of Falk et al.'s study by the zoo and aquarium community, we have shown that numerous methodological weaknesses render their findings difficult or even impossible to interpret. More important, their claims—extensively disseminated on zoo and aquarium Web sites—greatly outstrip their methodologically limited findings" (p.136). Dawson and Jensen [2011] are equally critical, stating that "Moreover, Falk et al. did not develop valid and convincing evidence of 'what visitors did in the institution' or of 'long-term meaning' (p.10); as such, this headline conclusion from the MIRP study is questionable at best" (p.136). Falk et al. [2010] provide a defense of their research, claiming that Marino et al. misrepresented the intent of the research and the methods used. Falk et al. [2010] conclude by criticizing Marino et al.'s more general assertion regarding the universal lack of evidence regarding zoo visitor impact, stating that they "seriously question the authors' [Marino et al.] use of this single, flawed critique, however, as the basis for their sweeping conclusion that there is no evidence that zoos and aquariums impact their visitors" (p.418). However, it is likely that some damage will have been done to the credibility of the original work (rightly or wrongly) simply because the work has been being targeted by published criticism. It is widely recognized that zoos face a challenge in attempting to measure the impact they have on their visitors. To conduct research where causal relationships can be confidently described would

probably require a controlled experimental design, which may be difficult (but not impossible) to facilitate in a zoo setting. By emphasizing their positive, impactful educational goals, zoos may have entrenched themselves into a difficult position where, because of their claims, they find themselves having to defend external challenges to their educational effectiveness without the necessary evidence to do so. At best, these criticisms present a platform for academic discourse about the nature of zoo visitor research and may encourage further study in this area. At worst, they make the educational claims of zoos look overzealous and lacking in valid supporting evidence. This is a serious challenge to one of the fundamental areas of modern zoo function.

TOP-DOWN APPROACH

The fact that zoo accreditation organizations have clearly defined goals relating to the kind of learning they wish to take place in their institutions does not necessarily sit comfortably with what is the more generally accepted model of learning in zoos and aquariums. Here, we find that learning is more constructivist in nature, where people construct personal meaning from their visit based on their preexisting knowledge, attitudes, and motivations for visiting [Rennie and Johnston, 2004; Falk, 2005; Storksdieck et al., 2005; Ballantyne et al., 2007; cf. Dawson and Jensen, 2011]. It is also self-directed (outside of "formal" taught interventions that zoos often offer to visiting educational groups) and, this is perhaps the most salient point, entirely "free-choice" [Kola-Olusanya, 2005]. Visitor experiences as well as the educational impact of the zoo visit may well be extremely varied and, as a consequence, difficult to recognize and measure.

Regardless of learning style or a zoo's educational provision, some visitors may "choose" not to engage with educational provision at all; for example, at Chester Zoo, only around 20% of zoo visitors attend public talks. We should not assume that all visitors would necessarily be uniformly interested in or motivated to learn about species conservation, habitats, adaptations, or even basic facts about animals just because they have decided to visit a zoo. Families are probably the most common visitor grouping we find at zoos, and parents may seek to support their children's learning or enjoyment [Knutson and Crowley, 2006; Melber, 2007]. We must even consider that a proportion of visitors that are actually interested in the natural world to some extent (or conservation-related topics) may not be motivated to consciously learn anything more about them on a particular zoo visit. They may simply seek to be refreshed and recover from the stresses of everyday life [Packer and Ballantyne, 2002].

When viewed in this context, the AZA statement regarding its members' role in "in educating over 175 million visitors" seems misguided.

Of course, large numbers of visitors may choose to actively engage with the educational provision on offer. Given the complexity of the learning environment and the varied motivations of zoo visitors, we argue that attempting to prescribe universal learning outcomes is foolhardy, if not bordering on the naive. The zoo community needs to implement research that is sufficiently flexible to allow for learning outcomes that are different from that which the zoo intended, including those that may be negative. Is visitor research in zoos even looking for these outcomes? This will not only assist in providing a more complete answer regarding the impact of a zoo visit, but may also answer some of the criticism applied to the educational value of zoos.

LOOKING FOR THE UNEXPECTED

By limiting research to investigate only institutional goals, we argue that researchers are limiting the scope of their work. Even if it were possible to evidence that an educational output correlates with the outcome we expected does not, in any sense, mean that this is the only outcome. There may be other social, cultural, or emotional outcomes (positive or negative) that could also be important. We do acknowledge that there is a body of work that has sought to explore a range of outcomes from a zoo visit; for example, Myers et al., 2004; Clayton et al., 2009; Fraser and Sickler, 2009. However, we find that there are a number of visitor-related studies in zoos that focus on changes in knowledge, attitudes or behavior (or a combination), and are often solely quantitative in approach [e.g., Lindemann-Matthies and Kamer, 2006; Randler et al., 2007; Visscher et al., 2009]. Mixed-methods designs incorporating qualitative methods may well be more adept at uncovering outcomes outside of those of the prescribed research question(s). Triangulation of this kind would also give added credence to (more generalizable) quantitative findings. Even if not used as part of mixed-methods research, separate qualitative studies could be implemented to uncover a more meaningful range of outcomes to be validated (or otherwise) by quantitative approaches. The key issue is that current and historical zoo visitor research attempts to answer questions such as "Are zoo visitors getting what we want them to get out of their visit?" Essentially, this is a closed question with an equally limited potential answer. We accept that evaluation research (as a formal branch of social research) is a valid way of assessing the effectiveness of predetermined goals, but in zoos we argue that it is also insightful and valuable to pose the question "What are zoo visitors getting out of their visit?" To answer this, a much wider range of potential outcomes must be allowed for in the methods implemented.

There is also perhaps the danger that zoos do not fully understand the processes involved in social change. In particular, that the "ideals" held by the institutions themselves do not automatically translate into "practices" at the

level of the visiting public [cf. Jensen and Wagoner, 2009]. Of more concern is that by assuming that increased knowledge may be influential in affecting public attitude and behavior, zoos are becoming perilously close to revisiting the now discredited "deficit model" of science communication, whereby it was assumed that widespread public support of, and attitudes toward, science was essentially a problem of deficient scientific literacy among the public, and that by simply filling that "deficit" with knowledge, support for science would follow [Miller, 2001]. Zoos would be wise to steer clear of making a similar mistake.

MEASURING A NEGATIVE

It is essential that research designs must be capable of uncovering negative outcomes, whatever the hypothetical position of the researcher or organization. Setting the "low-point" of any potential outcome as "no impact" is not acceptable, as it actually delegitimizes any subsequent claims for positive impact. This is especially important for in-zoo researchers who may be more open to external criticism. We must avoid the a priori, (although perfectly intuitive) assumption that because the zoo has positive educational aspirations, and designs educational resources and activities to deliver those aspirations, the visitor outcomes must be positive. They might not be.

A standard methodological approach in visitor impact research is a pre- and posttest design, perhaps using repeated measures or two different visitor samples from the same visitor population. Statistically comparing pre- and posttest differences between two visitor samples necessarily requires using the aggregated "scores" from the two measurements. This quantifies overall differences between the two samples, but it does not tell us about specific changes in individual cases. This means that if the overall (aggregated) change was positive, there may still be some individuals showing negative changes. Using repeated measures designs allow for the direction of change to be assessed, but it must be remembered that using paired-test statistics will still only give one significance value for the whole range of paired cases—essentially showing us the general (albeit significant) pattern within the data, but not highlighting individual cases that may deviate from this pattern. We are aware of very few zoo studies that tracked individual cases and actively looked for deviant outcomes. One example that did, Jensen [2011], reported on a large-scale study looking at the impact of a zoo visit for over 3,000 UK school children. One of the measures was the analysis of annotated drawings and it was found that while there was an overall statistically significant, positive change in drawings (between pre- and postvisit in a repeated measures design), a minority of drawings (just under 13%) showed a negative change postvisit. In some individuals, this change was related to a more negative perception of animals in captivity postvisit. This shows the danger of exclusively aggregating data; it can overlook important findings like this. This would seem problematic. However, it is also the route to a solution. Only by uncovering areas of potential negative impact can we target improvements specifically. By not attempting to measure negative outcomes in zoo visitor research, we are completely missing out on valuable sources of information.

CONCLUSIONS

Zoos and their accreditation bodies find themselves between a rock and a hard place. For many years, they have confidently promoted themselves as education providers particularly with regard to the conservation of biodiversity; perhaps even used this educational function as part justification for their existence. Because of this, the burden of evidencing educational impact falls squarely on the shoulders of zoos. Yet the research undertaken thus far (and there is a substantial amount) has clearly not been universally accepted as an effective demonstration of zoos' positive impact. Indeed, the peer-reviewed criticisms of recent years [RSPCA, 2006; Marino et al., 2010; Dawson and Jensen, 2011) would suggest that this issue is here to stay. Away from strategic educational goals and mission statements, we found evidence to suggest that accreditation bodies and some zoos were making public, causal claims about zoos, and their positive educational impact. The larger the claims, the larger the evidence-base required to support them.

The top-down educational positions of zoos and their accreditation bodies may be driving research that only looks for specific visitor outcomes, and potentially be missing outcomes outside this narrow remit. We propose that zoo visitor research takes on this challenge and develops research that can detect all possible outcomes, including ones that may be negative.

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