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# Does more interpretation lead to greater outcomes? an assessment of the impacts of multiple layers of interpretation in a zoo context

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## **Does more interpretation lead to greater outcomes?**

### **An assessment of the impacts of multiple layers of interpretation in a zoo context**

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#### **Abstract**

This study investigates the relationship between level of exposure to interpretive media and the cognition, affect and behaviour of zoo visitors, i.e. what they report knowing, feeling and doing following their interpretive experience at the zoo. . Visitors were surveyed at the exit to a particular zoo experience, a recently-opened lion exhibit that uses an array of static and face-to-face interpretive media to convey messages about the difficulties faced by lions, particularly when they come into contact with humans. A validated self-report instrument consisting of 29 items was used to capture ten cognitive, affective and behavioural indicators or outcomes of the interpretation. The 288 respondents experienced between one and four different interpretive media, and the results on every one of the ten indicators reveal that visitors' reported cognitive, affective and behavioural outcomes were greater, many with statistical significance, as the number of interpretive media increased. The findings confirm and extend previous research which found the cognitive impact of interpretation was greater with multiple layers of interpretation, but also suggest the need for further research with other types of interpretive media on other visitors and in a wider range of sustainable tourism contexts.

## **Does more interpretation lead to greater outcomes?**

### **An assessment of the impacts of multiple layers of interpretation in a zoo context**

#### **Introduction**

In recent decades, many tourism operations, including captive wildlife attractions such as zoos, have become more interested in and concerned with being able to demonstrate their conservation credibility (Ballantyne *et al.*, 2007; Mason, 2000; Rabb, 2004). For most tourism operations, this is due in part to a shift in community expectations of sustainable practice. For those tourism operations that sell themselves on a platform of sustainability, there is a need for differentiation and one way to demonstrate this is by showing that their products lead to positive impacts on the people who visit (Ham and Weiler, 2002; Moscardo, 1998). This may be particularly the case for zoos, for whom the need for conservation credibility comes on top of a moral and ethical struggle to justify confinement of wild animals (Jamieson, 1985, 1995).

Many zoos are active in a range of conservation initiatives including breeding programs and in-situ habitat and species preservation projects. However, such programs can exist without the need for operating a wildlife tourism attraction and exhibiting wildlife to the public. The present paper focuses on one aspect of conservation that is arguably what distinguishes captive wildlife attractions from other types of conservation organisations: their communication with visitors. Zoos and other nature-based attractions, tours and lodges harness face-to-face interpretation and other forms of visitor communication not only to enrich the visitor experience, but to deliver messages that are aimed at fostering appropriate attitudes and behaviours. Tourism operators keen to balance any detrimental impacts of their operations on host communities and environments may be particularly moved to deliver interpretation that has positive and potentially lasting impact on visitors. In the case of zoos, being able to demonstrate positive outcomes from their on-site communication is central to their being accepted as a legitimate player in sustainable tourism.

Zoos attract an enormous number of visitors compared to other wildlife-based tourism experiences, estimated by the World Association for Zoos and Aquariums (WAZA) as 600 million visitors annually (WAZA, 2005). Moreover, zoo attendance data reveal that visitors

come from a wide cross-section of the population, providing exceptional opportunities to communicate with both the converted (Beaumont, 2001) and other less environmentally-literate and conservation-active sectors of the population (Dierking *et al.*, 2002). Moreover, unlike television or other mass media, zoos provide opportunities to experience wildlife first-hand and often in close encounters, creating a rich environment for impacting visitors (Ballantyne *et al.*, 2007). For all of these reasons, zoos are strategically well-placed to utilise their on-site visitor interpretation not only to enhance visitor enjoyment, but also to impact what their visitors think, feel and do, and often have the resources to employ numerous communication channels (media) and techniques to do so. When they are well-conceived and informed by sound research, communication efforts can instil positive attitudes toward wildlife and foster appropriate behaviour that yields benefits that not only can compensate for but can outweigh any negative aspects of keeping and exhibiting wildlife in captivity (Tribe, 2004). What is lacking, however, is evidence that zoos are successful in achieving such communication outcomes with visitors (Mason, 2000; Smith *et al.*, 2008). More specifically, there is a lack of research on how different communication media and different interpretive techniques contribute to visitor outcomes. Of particular relevance to the present study, research is needed to demonstrate whether zoo interpretation via any particular interpretive medium and/or a number of interpretive media has a greater impact in delivering a range of cognitive, affective and behavioural outcomes.

The aim of this study, then, was to examine the relationship between interpretive media and visitor outcomes and, in particular, to examine the relationship between the number of interpretive media or channels of communication that a visitor is exposed to and the outcomes as reported by visitors in a particular captive wildlife tourism context. In this paper, exposure to an additional interpretive medium is referred to as a layer of interpretation, and interpretive outcome is measured in terms of its impact as perceived by visitors. To be specific, the research asks, are multiple media or layers of interpretation associated with greater impacts on visitors? A “yes” to this question supports the development and delivery of conservation messages via a suite of communication channels that aims not only to enhance the visitor experience but to impact visitors beyond the confines of captive wildlife settings.

The rationale for measuring interpretive impact in terms of perceived cognitive, affective and behavioural outcomes is outlined in the methods section of the paper. Prior to describing the

methods and results of the empirical study, the paper reviews key literature that informed the research question, study context and methodological approach. The paper concludes with implications of the findings for sustainable wildlife tourism and visitor interpretation generally and avenues for further research.

## **Review of Literature**

A number of studies have succeeded in identifying and measuring specific cognitive (knowing), affective (feeling) and behavioural (doing) outcomes of interpretation (see for example the reviews by Ham and Weiler, 2006 and Munro *et al.*, 2008), including the impacts of interpretation in zoos, aquariums and non-captive wildlife settings (e.g. Adelman *et al.*, 2000; White and Jacobson, 1994; Orams, 1994; Dierking *et al.*, 2002; Rabb, 2004; Randler *et al.*, 2007; Swanagan, 2000). Aside from the fact that most of these studies have focused on one or a few specific outcomes such as cognitive recall (e.g. how many or which facts visitors remember after an interpretive talk or tour) or attitudes toward conservation (e.g. how positive visitors feel toward particular species, environments or nature conservation generally), few have succeeded in *explaining* the outcomes of interpretation. Stewart *et al.* (1998), Madin and Fenton (2004), Ham and Weiler (2006), Ballantyne *et al.* (2007) and others have all called for more research that links experiential variables and other ‘inputs’ with interpretation outcomes.

There are a number of notable attempts by researchers to measure the impact of specific interpretive techniques and/or media choice on visitor outcomes, including cognitive recall (Porter and Howard, 2002); attitudes toward species (Morgan, 1996); and behavioural outcomes (Lackey and Ham, 2003). Generally, however, such studies have met with limited success due to the complex communication environment in which interpretation is delivered. Isolating the effects of one communication medium from another in field research is difficult, as is finding comparable groups of respondents, let alone randomly assigning visitors to experimental groups.

Aside from comparing the outcomes of one communication medium with another, there has been almost no research examining the benefits of using multiple media or layers of interpretation (Robertson and James, 2003). This seems surprising, given the general

recognition in the education and learning literature that using multiple communication media and multiple 'learning environments' enhances learning outcomes (e.g. Mayer, 2003). Acknowledgement of multiple intelligences and multiple learning styles (Gardner, 1983) is evident in communication contexts, such as the mass media, marketing, and health communication, and yet published research on the relative benefits of employing multiple media in the delivery of interpretation is almost non-existent.

A notable exception is Madin and Fenton's (2004) study of environmental interpretation programs on the Great Barrier Reef, discussed in detail here because of its focus on the number of interpretive media as an independent variable. On trips to the Reef, the researchers note that a visitor can choose to participate in none, one or multiple interpretive programs, ranging from a marine biology slide show on board a reef vessel, to pre-trip scuba diving briefings, to snorkelling and semi-submersible tours guided by a marine biologist. The study collected data from independent groups of pre-exposure (pre-interpretation) and post-exposure visitors regarding their self-reported knowledge and understanding of the Reef. Using factor analysis on the 443 responses to their 17-item questionnaire, they identified four factors: reef knowledge, human impacts, reef health and reef tourism. Based on a post-hoc analysis, each respondent was also assigned to one of three levels of activity: low (0-4 activities), moderate (5 activities) and high (6-10 activities). Visitors' self-reported scores of some of the knowledge factors were found to differ significantly depending on the number of interpretive activities participated in by the visitor. Specifically, respondents who participated in greater numbers of activities felt that they had both a greater knowledge of the reef environment and greater understanding of human impacts on the reef than those who participated in fewer activities (Madin and Fenton, 2004: 132).

This review of literature found no research comparing affective and/or behaviour outcomes from single vs. multiple layers of interpretation, either in a zoo context or in any other tourism setting. The present study extends the cognitive focus of Madin and Fenton's (2004) research to include affective and behavioural outcomes, something that Madin and Fenton themselves recommend (p. 135). As resources for interpretation become more and more difficult to access, there is increasing value in being able to determine whether the use of multiple media can be justified in terms of this full range of visitor outcomes.

## Study Context

Anecdotal evidence as well as organisational strategy and policy documents suggest that zoo interpretation aims to achieve a number of ambitious outcomes with visitors. The WAZA Conservation Strategy (WAZA 2005, 35) states that “education is a central role of all zoos and aquariums” and that “zoos and aquariums are excellent centres in which to inform people about the natural world and the need for conservation”. WAZA’s (2005) vision for conservation education and training is to influence people’s behaviour and values, and it sees zoos as having the audience and capacity to positively influence and harness visitors’ knowledge, understanding, attitude, behaviour and involvement (WAZA, 2005: 9).

The setting for the present study was Werribee Open Range Zoo (WORZ), one of three zoo properties managed by Zoos Victoria whose stated purpose is “to lead, inspire and empower everyone to connect with wildlife, build knowledge, develop skills and take informed action to conserve the natural world.” WORZ is situated in close proximity to the outskirts of Melbourne, Australia, a city of about 3.7 million. WORZ has an annual visitation of approximately 250,000 people consisting mostly of Melbourne residents. The zoo covers around 570 acres and includes a number of open range displays, viewed by taking a 45-minute bus tour, as well as some smaller, immersion exhibits. One of these exhibits, Lions on the Edge (LOTE) was opened in 2004 and displays lions at the end of a walking trail on which visitors are exposed to environs designed to be representative of Botswana. Numerous static displays are used throughout the exhibit to convey different messages about the difficulties faced by lions that live outside reserves, particularly when they come into contact with humans. To supplement the walk-through experience, WORZ offers four additional communicative media for interpretive engagement, all providing opportunities for the delivery of messages. The five individual interpretive experiences that are offered at LOTE are thus:

- Walk: the visitor walks along a walking trail containing static displays;
- Talk: the visitor attends a keeper talk (held twice a day) which lasts around ten minutes;
- Volunteer: the visitor interacts with a volunteer guide who responds to questions and/or offers a variety of information through casual interactions;

- Actor: the visitor encounters a role-play presented by a thematic interpreter who assumes a character and deliberately solicits interaction or a response from the visitor in an informal manner;
- Tour: the visitor pays extra to be taken behind the scenes for a “Rip Roaring Feed Tour” which includes, in addition to a lion talk, viewing the animals’ holding facilities culminating with lion feeding.

All visitors experience the walk and get an unobstructed view of the lions through glass in a large open-air viewing area. In addition, visitors can experience one, two, three or four of the additional interpretive experiences outlined above.

### **Methods and Limitations**

As discussed earlier, the aim of this research is to determine whether and to what extent exposure to multiple interpretive media is associated with greater visitor outcomes, i.e. greater cognitive, affective and behavioural impacts. This section begins with the operationalisation and measurement of the constructs of visitor outcomes (the dependent variables) and interpretive media (the independent variable). This is followed by a description of the field methods including sampling. The section ends with a brief overview of the methods used for data analysis.

One reason why interpretation outcomes are poorly understood and largely under-researched is that, until recently, there was a lack of valid and reliable instruments for measuring these outcomes (Madin and Fenton, 2004). For the present study, the nature-based tourism instrument of the STCRC’s *Interpretation Evaluation Tool Kit* was used, which consists of twenty-nine questions that measure ten interpretive outcomes (Ham and Weiler, 2005). The tool kit was developed in an 18-month process that began with a series of tourism industry workshops using nominal group technique (Delbecq & Van de Ven, 1971), a widely accepted tool for to identify and rank what staff felt were the most important indicators of “successful” or “effective” interpretation in their tourism operations (Ritchie, 1994). A number of steps were taken to ensure that the final set of indicators were realistic and achievable through on-site interpretation as well as of relevance to a wide cross-section of industry. Firstly, participants in the nominal group process included program managers, front-line interpreters and guides, sales and marketing staff, and mid- or executive-level administrators and were



guided through a process that aimed for consensus in prioritising the desired outcomes of interpretation. Secondly, each indicator produced through the nominal group process was assessed with respect to whether it could realistically be expected to be impacted by interpretation; and whether it could be measured simply yet reliably by a non-social scientist. Thirdly, the researchers worked with input from a nation-wide industry reference group through a number of stages of reduction, refinement, field-testing with real visitors, and validation (Ham and Weiler, 2006). The reliability results of the field testing for the nature-based instrument are shown in Table 1.

**Table 1: Indicators of Interpretation Outcomes for Nature-Based Experiences**

<b>Indicator Name</b>	<b>Type of Response*</b>	<b>Reliability (alpha)</b>
<b>A.</b> Impact on appreciation of indigenous connections to nature	Cognitive/ Affective	.95 (4 items)
<b>B.</b> Elaboration (provoked to thought)	Cognitive	.88 (5 items)
<b>C.</b> Positive attitude toward nature conservation	Affective	.73 (3 items)
<b>D.</b> Positive global evaluation of interpretation at site	Affective	.84 (4 items)
<b>E.</b> Desire to participate in additional interpretive activities	Behavioural	N/A (1 item)
<b>F.</b> Desire to purchase a memento or souvenir related directly to site story	Behavioural	N/A (1 item)
<b>G.</b> Desire to stay longer	Behavioural	N/A (1 item)
<b>H.</b> Desire to return for repeat visit	Behavioural	N/A (1 item)
<b>I.</b> Positive word-of-mouth advertising	Affective/ Behavioural	.90 (5 items)
<b>J.</b> Visitors found it relevant and meaningful to their lives	Cognitive	.67 (4 items)

\*While referred to throughout as ‘behaviour’, each behavioural indicator in this suite of indicators is actually an attitude toward the behaviour as opposed to an observed behaviour.

The result of this process was the selection of indicators and the development of a final evaluation package that: (1) reflects the types of outcomes that tourism operators (in this case zoos) want from their interpretive programs (for example, enhanced visitor enjoyment, positive visitor attitudes about conservation, positive word-of-mouth advertising, provoking visitors to think about the values inherent at the site, etc.), (2) is theoretically valid based on what is known about interpretation’s potential impacts on how visitors think, feel, and

possibly behave with respect to the things being interpreted for them, (3) provides methodologically reliable measures, and (4) requires minimal time and effort on the part of the respondent (typically 5 to 7 minutes) and is quick and easy to administer in the field. The Tool Kit has been purchased by a wide range of industry and government bodies in Australia and several other countries.

There are some limitations to the use of this questionnaire. Firstly, while there are many benefits to having a generic instrument that can serve as a benchmark against other sites and interpretive products, such an instrument is by definition not customised to either the organisation or the interpretive program. It would seem logical that an interpretive program or activity should be judged against its stated objectives, for example, in the case of zoos, actual conservation action of visitors. However, many such stated objectives are difficult to measure in the context of a one-off research project as well as unrealistic to achieve as a result of a single interpretive program or zoo visit. Moreover, Madin and Fenton (2004) point out that much interpretation is developed and implemented in the absence of clear objectives, making it impossible to use these as a basis for gauging “success” or “effectiveness”. Instead, like the present study, they use a “bottom up approach” (p. 123) informed by visitors as well as more general interpretive objectives gleaned from the literature (Weiler and Davis, 1993) to develop evaluation criteria.

A second limitation of the questionnaire is that it relies on visitors’ perceptions of how the interpretation impacted them cognitively (e.g. “made me think”), affectively (e.g. “made me value nature conservation more”), and behaviourally (e.g. “made me want to attend another interpretive activity”). In other words, the instrument does not test visitors on what they actually know nor does it observe what they actually do as a result of the interpretation. Again this is similar to Madin and Fenton’s methods, except that they used visitors’ self-reported knowledge and understanding rather than visitors’ judgement of the *impact* of the interpretive program on these outcomes. Measuring actual post-visit behaviour outcomes, for example, as opposed to a visitor’s statement of what he or she desires or intends to do, requires a more complex research design and introduces many other measurement issues beyond the scope of the present research. Further discussion of such issues can be found in Ham and Weiler (2006) and Smith *et al.* (2008).

In summary, the dependent variables for this study were measured using the 29-item on-site self-completed visitor questionnaire developed and validated for an array of interpretation experiences in nature-based settings as shown in Table 1. (The research instrument is available from the authors upon request.) Six of the ten indicators use multi-item 7-point semantic differential scales (between 3 and 5 items per indicator) and are largely indicators of the respondent's perceptions of the cognitive/affective outcomes of the interpretation, while the remaining four indicators use single-item yes/no response items and are indicators of the respondent's perception of the behaviour outcomes of the interpretation. In each case, respondents were asked to gauge how the Lions on the Edge (LOTE) experience impacted them.

The independent variable, the layers of interpretation, was measured by the reported type and more importantly the reported number of interpretive media the respondent experienced, with a theoretical range of just one (Walk only) through to five (Walk, Talk, Volunteer, Actor and Tour). In summary, these naturally occurring groups of respondents were used to create an experiment-like environment in a field setting in order to examine the relationship between the type and number of interpretive media and interpretive outcomes. While such a design falls short of being able to demonstrate causality, "the results of such studies are still compelling, because they are not artificial interventions in social life and because their ecological validity is therefore strong" (Bryman and Bell, 2003: 46).

Field work took place over a three-month period from October 2006 to January 2007, including both holiday and non-holiday periods and both weekdays and weekends. Visitors were approached as they exited the LOTE experience using systematic sampling methods to minimise sampling bias (Bryman & Bell, 2003). They were invited to complete the 10-minute questionnaire, which included seven additional socio-demographic and trip questions in addition to the 29 questions measuring ten indicators of interpretive outcomes.

Respondents were also asked to report which of the five interpretive experience(s) they had been exposed to and this information was also recorded on the questionnaire. Given that visitors could not be randomly assigned to the different interpretive experiences, the socio-demographic and trip questions were used to look for between-group differences. While it was not possible to isolate the independent variable as causal, the inclusion of demographic and trip variables made it possible to dismiss some potentially influential factors on visitor outcomes.

After cleaning the data and eliminating unusable responses, there were 288 useable responses. To obtain measures for each of the six multi-item indicators, scores from each of the items in the multi-item scale were summed and then divided by the number of items to arrive at a mean score for each indicator that was between 1 and 7. For the remaining four single-item indicators, scores were obtained by calculating the frequency of “yes” responses. All statistical analyses reported here use a p-value of 0.05.

## **Results**

A total of 288 zoo visitors were surveyed out of approximately 335 who were approached, a response rate of 86%. The most common explanation for refusing to complete the survey instrument was that there was not enough time to do so, due in part to the fact that most visitors pre-book on scheduled bus tours, which is the only way they can experience the open-range section of the zoo. The other most common reason for refusal was the weather; one day in particular was extremely hot and 40% of all refusals were on this day.

Respondents were mainly from the state of Victoria (83%) and only 12 respondents (fewer than 5%) were from overseas. Most respondents (72%) were first-time visitors to the Lions on the Edge (LOTE) experience, and the majority of those who had visited previously had visited only once before. There were 42% male and 58% female respondents, and an even split of adult-only groups and groups that included one or more children.

As outlined under Methods, the multi-item indicators were measured using mean scores. The multi-item dependent variables were visually and statistically checked for skewness and kurtosis. All six multi-item indicators met Kendall and Stuart’s (1977) requirements on these measures.

In addition, the reliability of the multi-item indicators were re-tested (using Cronbach’s alpha) to confirm that the sub-indicators were varying consistently with each other and with the overall indicator they comprise. The results were reassuring, with the alpha of one of the indicators at .69 and the rest well above this.

The 288 respondents were then allocated to one of four groups depending on the number of interpretive experiences they had on the day they visited LOTE (see Study Context for a fuller explanation of each of these experiences). For example, those who experienced only the Walk were allocated to group 1 (119 respondents). Those who did the Walk and one other experience were allocated to group 2 (102 respondents). There were 65 respondents who had three experiences, only 2 respondents had 4 experiences, and none had 5 experiences. (See Table 2.)

**Table 2: Frequency of respondents experiencing 1, 2, 3 and 4 interpretive experiences**

<b>Number of experiences</b>	<b>Frequency</b>	<b>Percent</b>
<b>1</b>	119	41.3
<b>2</b>	102	35.4
<b>3</b>	65	22.6
<b>4</b>	2	.7
<b>Total</b>	288	100.0

*Eliminating rival hypotheses*

Prior to looking for differences in indicator responses for the different groups, the researchers looked for differences in responses based on socio-demographic and trip variables, to rule out the possibility that some differences between respondent groups might be due to variables other than the interpretation itself. A series of Chi-squares (for yes / no questions) and t-tests (for multi-item indicators) revealed no significant differences with respect to place of residence (Victoria vs other, Australian vs overseas), first-time vs. repeat visitor, group type (adult-only vs. groups with children), weekend vs. weekday and whether they visited during peak or off-peak times.

*Examining the relative impact of individual communication media*

In the case of respondents who had two interpretive experiences, they may have had a combination of the Walk and Talk, the Walk and Volunteer, or the Walk and Actor. To examine whether any one of these individual experiences performed better than the others on the interpretive indicators, a test for differences between the types of interpretive experiences was undertaken. A one-way ANOVA was used to look for these differences on the indicator

scores of the 102 respondents who had two interpretive experiences (the Walk plus one other). Analysis revealed similar scoring (no significant differences) on all indicators across all combinations of two interpretive experiences, although the results are somewhat inconclusive due to the small sample sizes (n=59 for Walk and Talk, n=22 for Walk and Volunteer, and n=21 for Walk and Actor). Nonetheless, the results provide further support for this paper’s focus on differences based on the number of interpretive experiences, rather than on the particular content or medium of any one of the experiences.

*Testing the relationship between the number of interpretive media and outcomes*

The remainder of the findings relate directly to the aim of this paper: to examine the relationship between the *number* of interpretive media that a visitor is exposed to and the outcomes of that interpretation. In the first set of analyses undertaken to answer this question, the mean scores for each of the six multi-item indicators of cognitive/affective interpretive outcomes were cross-tabulated against the number of interpretive experiences that respondents encountered. The results as well as the mean scores for all respondents for the multi-item indicators can be seen in Table 3.

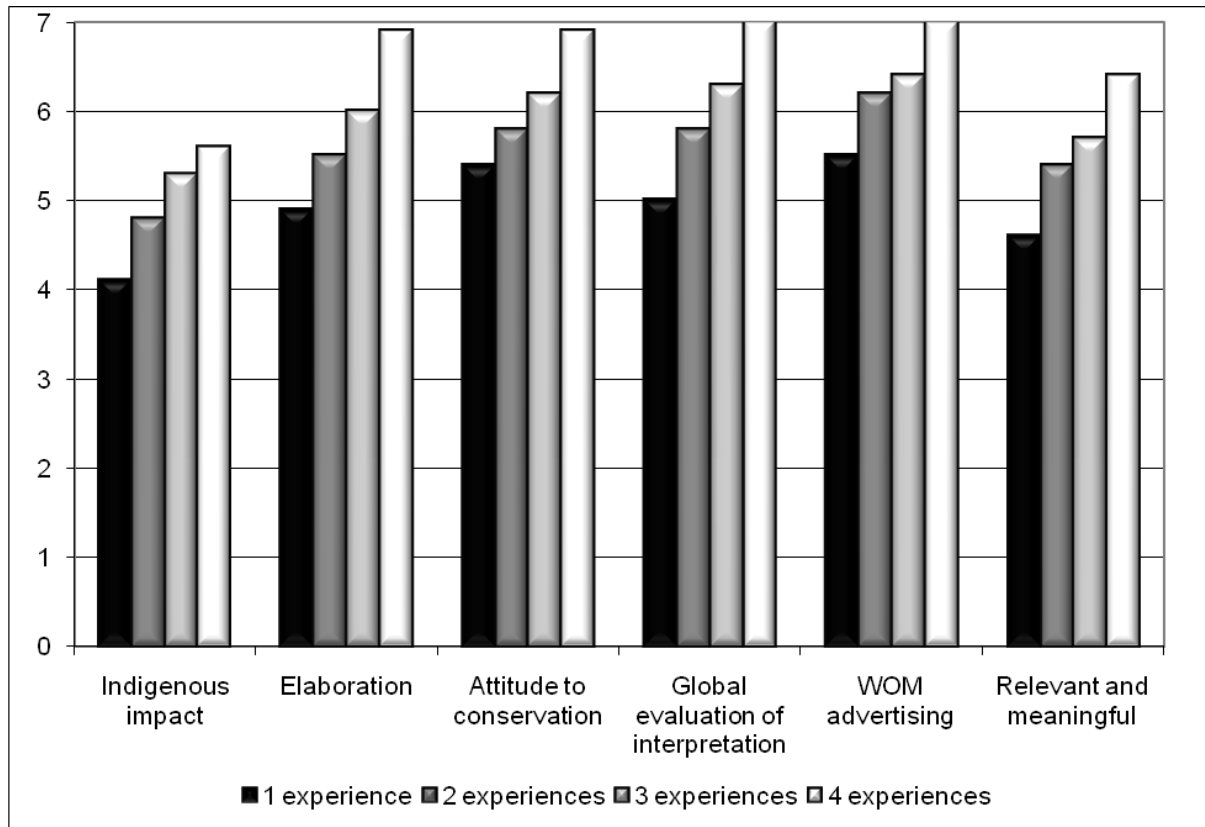
**Table 3: Cross-tabulation comparing mean scores against the number of interpretive experiences for the six multi-item indicators of interpretation outcomes.**

Number of interpretive experiences had by respondent		A Impact on appreciation of indigenous connections to nature	B Elaboration (provoked to thought)	C Attitude toward nature conservation	D Positive global evaluation at site	I Positive word-of-mouth advertising	J Visitors found it relevant and meaningful to their lives
1 (n=119)	Mean	4.1	4.9	5.3	5.0	5.5	4.6
2 (n=102)	Mean	4.8	5.5	5.8	5.8	6.2	5.4
3 (n=65)	Mean	5.3	6.0	6.2	6.3	6.4	5.7
4 (n=2)	Mean	5.6	6.9	7.0	7.0	7.0	6.4

\*standard deviations (SDs) ranged from 0.8 to 1.5 with the exception of group 4, where SDs were very low or nil due to the fact that there were only 2 respondents in this group

Table 3 reveals a consistent increase in mean indicator scores across all six multi-item indicators as the number of interpretive experiences increases. For example, the mean score for Indicator A *appreciation of indigenous connections to nature* for the respondents who had only one interpretive experience was 4.1; for those who had two interpretive experiences, the mean score was 4.8; with three experiences it was 5.3; and those who had four interpretive experiences had a mean score of 5.6 for this indicator. While it cannot be concluded that

exposure to more interpretive media *caused* respondents to report greater outcomes, it is certainly evident that the more layers of interpretation experienced, the greater the interpretive outcomes reported by respondents. This pattern is consistent across all multi-item indicators, revealing a distinct and approximately linear relationship between the number of interpretive experiences and the outcomes of the experience. This is illustrated graphically in Figure 1.



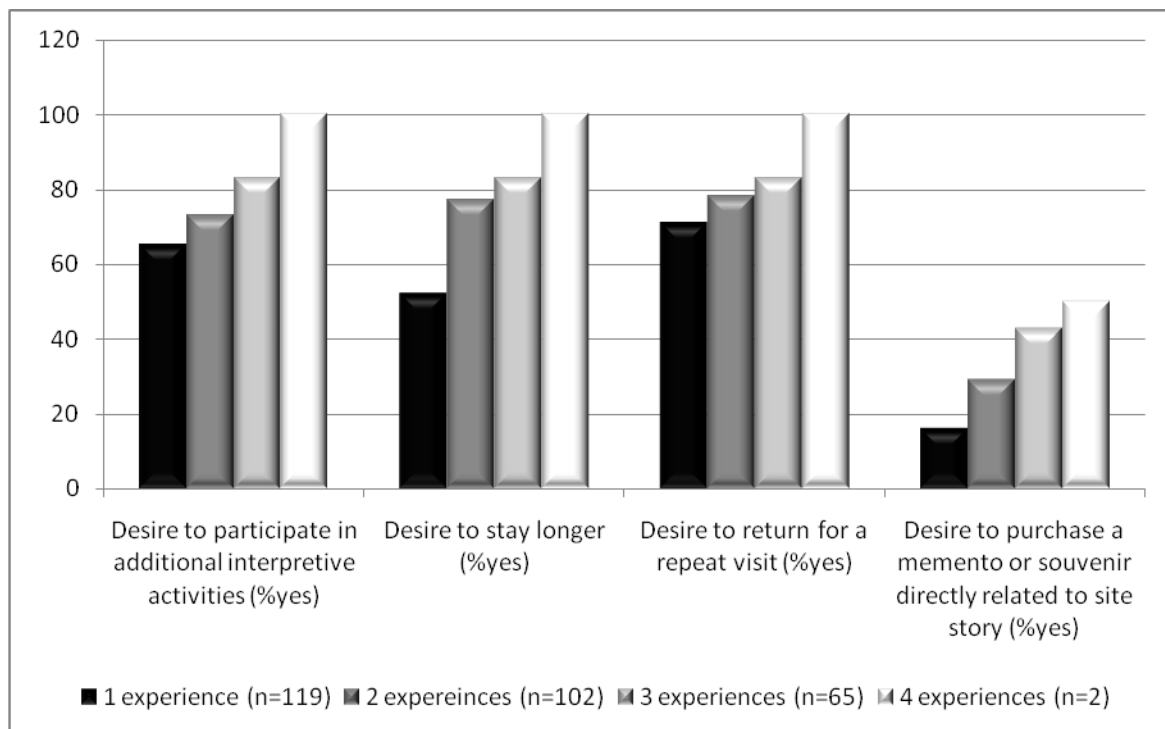
**Figure 1. Relationship between mean scores and number of interpretive experiences for the six multi-item indicators of interpretation outcomes**

A second set of analyses were undertaken to determine whether multiple layers of interpretation resulted in a greater impact on visitors. These relate to the single-item measures of interpretive outcomes, and the results are equally as compelling. For the four nominal single-item variables, each of which measures a respondent’s attitude toward the behaviour, the frequency of “yes” responses is used to indicate respondents’ scores. Table 4 shows a cross-tabulation of percentage of “yes” responses against the number of interpretive experiences that respondents encountered. Here too, there is a clear pattern, illustrated graphically in Figure 2, where the percentage of respondents who reported that their attitude

toward the behaviour had been impacted increases with the number of interpretive experiences.

**Table 4: Cross-tabulation comparing percentage of “yes” responses against the number of interpretive experiences for the four single-item indicators of interpretation outcomes.**

Number of interpretive experiences had by respondent		E Desire to participate in additional interpretive activities	F Desire to stay longer	G Desire to return for a repeat visit	H Desire to purchase a memento or souvenir directly related to site story
1 (n=119)	% yes	65	52	71	16
2 (n=102)	% yes	73	77	78	29
3 (n=65)	% yes	83	83	83	43
4 (n=2)	% yes	100	100	100	50



**Figure 2. Relationship between “percentage yes” responses and number of interpretive experiences for the four single-item indicators of interpretation outcomes**

Returning to the mean score results on the six multi-item indicators, a between-subjects MANOVA was conducted with these six multi-item indicators as dependent variables, with



the number of experiences as the between-groups factor. Levene's test revealed that three of the multi-item indicators violated the assumption of equality of variance. These were *attitude to nature conservation*, *positive word-of-mouth advertising* and *positive global evaluation of interpretation at the site*. To compensate, Tabachnick and Fidell (1996) suggest an adjustment of the univariate F-test level of significance to .01. The results revealed a statistically significant difference in the dependent variable means (Pillai's trace (F) = 6.549,  $p < .01$ , partial eta squared = .13). An analysis of the dependent variables individually revealed that all were significant at the .01 level. An inspection of the means revealed that those who experienced a greater number of interpretive experiences scored higher on the six multi-item indicators. Table 5 summarises the results of the MANOVA, showing the individual *F* statistic, partial eta-squared score, and significance level for each of the six multi-item indicators.

**Table 5: Results of MANOVA for the six multi-item indicators with number of experiences as the between-group factor.**

<b>Dependent Variable</b>	<b><i>F</i></b>	<b>Sig.</b>	<b>Partial Eta Squared</b>
Mean impact on appreciation of indigenous connections to nature	17.24	.000	.11
Mean elaboration (provoked to thought)	26.08	.000	.16
Mean attitude toward nature conservation	15.99	.000	.10
Mean positive global evaluation at site	34.93	.000	.20
Mean positive word-of-mouth advertising	18.11	.000	.12
Mean visitors found it relevant and meaningful to their lives	27.61	.000	.17

Specific differences in means were analysed using one-way ANOVA with Tukey's HSD post hoc test for individual comparison of means. Results demonstrated significant group differences in almost all cases on all indicators (one experience vs two experiences, one vs three, two vs three), except between the two and three experience groups on the indicators of *finding the interpretation relevant and meaningful to their lives*, *positive word-of-mouth advertising* and *the impact on indigenous connections to nature*. In these cases, the three-experience group had higher scores than the two-experience group on the indicators, but the differences were not significant at the .05 level.

The results of these analyses are consistent and compelling. Visually and statistically, it is evident that the greater the number of layers of interpretation that a visitor experiences, the higher the visitor rates the impact of the experience on every one of the ten cognitive, affective and behavioural indicators.

### **Implications and conclusions**

This study found that no individual interpretive medium performed better in terms of any of the ten indicators of visitor cognitive, affective and behavioural outcomes. Given that there are considerable differences in the costs of provision of the various interpretive media, this is an important finding that may need further follow-up. While the present study did seek to eliminate respondent bias and self-selection as a factor in interpretive outcomes, the analysis had to rely on basic socio-demographic profile data. It is not known, for example, whether visitors who chose to purchase the behind the scenes “Rip Roaring Feed” tour, for example, were visitors with high cognition needs and/or whether they differed significantly from other visitors in their trip motives. Either way, for managers wishing to impact what visitors know, feel and do, the current study provides no basis for recommending any one particular communication channel or medium over another.

On the other hand, the results suggest that the more media that are used to communicate with zoo visitors, the greater the impact. Perceived cognitive, affective and behavioural outcomes were all significantly higher for visitors who were exposed to multiple media as compared to just one interpretive medium. In comparing independent groups of visitors engaged in this metropolitan zoo experience, each additional layer of interpretation produced higher mean scores on every indicator, many of which were statistically higher. This is consistent with Madin and Fenton’s (2004) findings of multiple layers of interpretation on the Great Barrier Reef. In their study, visitors’ self-reported knowledge and understanding of reef ecology and human impacts on the reef increased as the number of interpretive activities participated in by the visitor increased. The present study, however, extends this beyond cognitive outcomes: multiple layers of interpretation, it seems, can also enhance perceived affective and behavioural outcomes.

The results of this study provide compelling evidence that experiencing multiple layers of interpretation in this particular zoo context enhanced the perceived impact of the interpretation on the visitor. However, it should be noted that the standard of the interpretation at this particular zoo is very high, utilising trained and motivated staff and volunteers. The study was conducted in a single zoo environment and, although consistent with Madin and Fenton's findings of visitors' cognitive outcomes in a marine environment, the methods and relationships need further testing in other tourism settings. Other types of media and experiences may yield different outcomes, and it would also be valuable to evaluate the outcomes of interpretation designed to deliver specific messages or themes, to gauge whether the use of multiple layers of interpretation enhances the understanding and retention of these messages. Of particular importance in the context of sustainable tourism is the need to evaluate attitude changes and other outcomes of messages aimed at delivering conservation behaviours.

Also, as mentioned earlier, both the present study and the Madin and Fenton (2004) study are based on self-report measures that, while thoroughly tested and validated, are limited to what the visitor "reports", rather than any objective measure such as knowledge testing, pre- and post-measures of attitude, or observation of actual behaviour. There needs to be further methodological and empirical work on measuring the actual (as opposed to perceived or self-reported) impacts on cognitive, affective and behavioural constructs, requiring a before-and-after research design ideally with a control group and random assignment of respondents to groups, something that is not easily accomplished with tourists in a naturalistic field setting. Even more challenging is to assess the long-term impacts of single vs. multi-media interpretation by collecting post-visit data, similar to the recent study by Smith *et al.* (2008)

Notwithstanding the need for replication and further research, the findings of this study have implications from both a practical and a theoretical perspective. For those organisations who seek to impact how visitors think, feel and behave, the use of multiple media / layers of communication looks to be a promising strategy for enhancing the outcomes of interpretation. Theoretically, the findings lend support to the application of multiple intelligence / multiple learning theory in a non-formal learning environment.

Like Madin and Fenton (2004), the greatest contribution of the present study may be in terms of research design and methods. As argued some years ago by Orams (1994) and highlighted again by Madin and Fenton, there is an urgent need to develop strategies for assessing the effectiveness of interpretive programs. The instrument used in the present study is both industry-grounded and theoretically-informed and thus is a valid as well as statistically reliable measure of interpretive outcomes. The research design and sampling methods ensured that sampling and response bias were minimised, and subsequent data analyses ruled out rival hypotheses. Notwithstanding the fact that isolating the potentially causal factors or variables that explain or predict the outcomes of interpretation remains an important research challenge, it is recommended that the methods used in the present study be replicated in other settings. The current instrument might be supplemented with items that align with the stated objectives of specific interpretive programs, for example, items might be added to assess the extent to which interpretive content is transmitted. This needs to be done carefully, however, to ensure that there is not undue emphasis on factual recall if in fact the desired cognitive outcomes of the interpretation are something else. Perhaps more importantly, outcomes such as long-term conservation behaviour could be added, particularly if the research design is expanded to include post-visit data collection.

In conclusion, the use of multiple layers of interpretation is not only important to ensure that visitors are able to self-select interpretive media that appeal to them, it appears to be invaluable for managers of captive wildlife attractions and other tourism operations who are serious about impacting the way their visitors think, feel and act. In this sense, zoos have a real opportunity to leverage off this and other research to design interpretation and experiences that deliver measurable outcomes. This would enhance their credibility and confirm their capacity to achieve conservation and sustainability outcomes that extend well beyond the spatial and temporal limits of a day at the zoo.

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