Visitors’ learning for environmental sustainability: testing short- and long-term impacts of wildlife tourism experiences using structural equation modelling

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Abstract

Wildlife tourism experiences have the potential to positively impact tourists’ awareness, appreciation and actions in relation to the specific wildlife they encounter and the environment in general. This paper investigates the extent of such impact across multiple sites, and uses Structural Equation Modelling to identify factors that best predict positive long-term learning and environmental behaviour change outcomes. Three sets of variables were measured – visitors’ entering attributes (including pre-visit environmental orientation and motivation for the visit), salient aspects of the experience, and short- and long-term learning and environmental behaviour change outcomes. Although attributes such as pre-visit commitment and motivation to learn were among the best predictors of the long-term impact of the experience, there was evidence that aspects of the experience were also important. In particular, reflective engagement which involved cognitive and affective processing of the experience was found to be associated with short- and long-term environmental learning outcomes. The implications for wildlife tourism managers are discussed.

Keywords

Wildlife tourism, visitor experiences, tourist behaviour, environmental behaviour, environmental learning
Introduction

Wildlife tourism can be broadly defined as tourism undertaken to view or encounter wildlife (Newsome, Dowling & Moore, 2004). It takes place in a range of settings, in natural or artificial environments, where animals are free or captive, and where visitors can interact closely with the animals or merely watch from a distance. This form of tourism is becoming increasingly popular as wildlife tourism destinations become easier to access, and the public becomes more aware of and interested in environmental issues (Higginbottom, 2004; Newsome et al, 2004; Rodger et al., 2007).

Clearly, the wildlife tourism experience can have an enormous impact – both positive and negative – on its human and non-human participants. For the tourists, the impacts are mostly positive, and include heightened awareness, appreciation of and reconnection with nature, personal rejuvenation and a realisation of personal responsibility for the state of the environment (Ballantyne, Packer, Hughes & Dierking, 2007; Falk, 2009; Powell & Ham, 2008). For the wildlife, the impacts are both positive and negative. The positive impacts include providing income for the ongoing protection and sustainable management of wildlife and wildlife habitats (Buckley, 2002; Fennell, 1999; Goodwin, Kent, Parker & Walpole, 1998; Wells, 1997; Wilson and Tisdell, 2001; Zeppel & Muloin, 2007); encouraging visitors to make financial and non-financial contributions to environmental causes (Powell and Ham, 2008); providing socio-economic incentives for the conservation of natural resources (Higginbottom, Northrope and Green, 2001; Schänzal and McIntosh, 2000); and influencing tourists’ behaviour during their visit (Medio, Ormond & Pearson, 1997; Orams and Hill, 1998). The negative impacts on wildlife include the possibility of injury, disease, distress, disruptions to natural behaviors and breeding patterns, pollution or destruction of habitats, or even death (Ballantyne & Hughes, 2006; Constantine & Bejder, 2007; Green & Giese, 2004; Green and Higginbottom, 2001; Higginbottom, Northrope & Green, 2001; Knight and Cole, 1995; Newsome et al. 2004; Reynolds & Braithwaite, 2001; Shackley, 1996).

Although the positive and negative impacts of tourism on the specific wildlife involved in the experience may appear to be in balance, if wildlife tourism experiences can be shown to have a long-term positive impact on tourists’ environmental attitudes and behaviours after they leave the site, the net effect for wildlife in general would quite clearly be a positive one. It is important, therefore, to determine the extent to which wildlife tourism experiences elicit positive and lasting changes in human environmental knowledge, attitudes and particularly behaviours, and to identify those aspects of the visitor experience that are most effective in achieving these.

Recent research (Ballantyne et al., 2007; Ballantyne and Packer, 2009; Lee and Moscardo, 2005; Tisdell and Wilson, 2005; Zeppel & Muloin, 2007) has begun to demonstrate the positive impacts of wildlife tourism on visitors’ environmental knowledge and attitudes, by raising visitors’ awareness of environmental issues, developing their respect and appreciation for wildlife and nature, and promoting environmentally sustainable attitudes and actions. However, there have been few studies that have attempted to deeply
understand the causative factors that affect such changes, or to investigate these broad patterns across multiple sites and experiences (Zeppel and Muloin, 2008).

The research reported in this paper used Structural Equation Modelling to identify factors that best predict the long-term impact of a wildlife tourism experience. It aimed to investigate how visitors’ entering attributes combine with specific aspects of the wildlife tourism experience to produce changes in visitors’ environmental knowledge, attitudes, and engagement in environmentally sustainable practices. The relationships between three sets of variables were investigated:
(a) visitors’ entering attributes (including pre-visit environmental orientations and motivations for the visit);
(b) salient aspects of the experience; and
(c) short- and long-term impacts on visitors’ environmental learning and behavioural outcomes.

Structural equation modelling is a statistical technique for testing causal relationships based on non-experimental data (Blunch 2008). Its application in the context of wildlife tourism enables the identification of factors that are most influential in bringing about long-term learning and behaviour change outcomes. It was hypothesised that visitors’ entering attributes (including environmental orientations and motivations for the visit) and visitor experiences would have both direct and mediated effects on short- and long-term learning outcomes, as illustrated in Figure 1.

Method

Participants and procedure

Pre- and post-visit questionnaires were administered at four sites offering marine wildlife tourism experiences (an aquarium; a marine theme park; a turtle nesting and hatching experience; and a whale watching experience), all in Queensland, Australia. These sites and experiences were selected to represent a range of wildlife encounters (e.g., animal shows, interaction with captive animals, experiences with non-captive animals, signed exhibits, guided tours and self-guided discovery).

The data collection procedures varied from site to site due to the unique considerations associated with each. A target of at least 150 completed questionnaires per site was set.
- At the whale watching experience, the pre-visit questionnaire was completed and collected before boarding the tour boat (N=304) and the post-visit questionnaire was distributed and collected on the return trip (N=282 returned; 93%).
- At the aquarium, pre-visit questionnaires were distributed and collected at the entrance (N=294). Participants were given a post-visit questionnaire which they were asked to complete and return at the exit (N=258; 88% returned).
At the turtle experience, the pre-visit questionnaires were administered and collected at the entrance to the site (N=452). As the experience was often not completed until quite late at night and lights were kept low to avoid disturbing the turtles, participants were given the post-visit questionnaire and asked to return it in a post-paid envelope as soon as possible after the experience. A total of 142 (31%) were returned.

At the marine theme park, visitors were given a combined pre- and post-visit questionnaire. They were asked to complete the initial section before commencing their visit, and then to complete the final section on completion of their visit and return both together at the exit or using a post-paid return envelope. A total of 575 questionnaires were distributed and 223 were returned with both sections completed (39%)

Four months after their visit, a sub-sample of visitors (n=240) responded to a web survey designed to obtain rich, descriptive data regarding the impact of the experience as well as quantitative data regarding changes over time in their self-reported engagement in environmentally sustainable practices motivated by the wildlife-based tourism experience. The numbers of responses from each site, at each stage of the data collection process, are reported in Table 1.

Insert Table 1 about here

**Independent and dependent variables**

**Visitors’ entering attributes.** The measurement of entering attributes with a potential impact on visitors’ learning and behavioural outcomes was based on previous research in other tourism and leisure settings such as the National Aquarium in Baltimore (Adelman, Falk and James, 2000; Haley Goldman et al., 2001) and the California Science Center (Falk & Storksdieck, 2005). These variables included pre-visit environmental orientations and motivations for the visit.

**Salient aspects of the experience.** Aspects of the experience likely to impact on visitors’ learning in wildlife tourism experiences were identified from previous research on free-choice learning in general (Falk & Dierking, 2000; Falk & Storksdieck, 2005), and environmental experiences in particular (Ballantyne & Packer, 2002, 2009a). Such variables included, for example, the opportunity for interaction with staff, discussion with companions, level of emotional engagement, and nature of contact with animals.

**Short- and long-term impacts on visitors’ learning and behavioural outcomes.** Learning outcomes are here defined as the deepening and expanding of personal knowledge and understanding of environmental sustainability issues; changes in awareness, appreciation and concern for wildlife; development of intentions to take or refrain from specific personal actions that have an impact on the environment; and enactment of lifestyle changes designed to support environmental sustainability. Many of these outcomes, particularly in relation to changes in actual environmental behaviour, may only become apparent weeks or months after the experience (Adelman et al, 2000; Anderson, Storksdieck & Spock, 2006; Ballantyne and Packer, 2009b; Falk, et al., 2004). Thus the dependent variables in this
study included short-term changes in knowledge, attitudes and behavioural intentions measured immediately after the visit, and long-term changes in environmental knowledge, attitudes and actual behaviour measured four months later.

**Instruments**

The pre-visit questionnaire included items designed to measure:
- Interest in nature, wildlife and environmental issues (5 items, each on a 7-point scale);
- Self-rated knowledge about wildlife conservation (1 item on a 1-10 scale);
- Engagement in environmentally responsible behaviours such as conserving energy and recycling (12 items, each measured on a 5-point scale); and
- Motivations for visiting (20 items in 4 categories – learning and discovery, passive enjoyment, social contact and restoration – drawn from previous research by [author reference withheld], each rated on a 7-point scale).

The post-visit questionnaire included items designed to measure:
- Self-rated knowledge about wildlife conservation (repeated from the pre-visit questionnaire);
- Attitudes towards nature and environmental protection (15 items, each on a 7-point scale, respondents were asked to rate how they felt both before and after their visit);
- Self-reported changes in environmental awareness, understanding, attitudes and concern as a result of the visit (8 items, each on a 5-point scale); and
- The extent to which visitors were engaged in various aspects of the experience, such as getting a good view of the animals or discussing new information with a companion (12 items, each on a 5-point scale).

The follow-up web survey asked respondents to provide descriptive qualitative responses to a number of questions regarding the impact of the wildlife experience on their environmental knowledge, attitudes and behaviour. These responses were coded using four-point scales, as indicated in Table 2, and each respondent received a score from 1-4 on each scale. Two researchers coded the responses and an acceptable level of inter-rater reliability was achieved: Intraclass correlation (ICC) = 0.84 for Knowledge; 0.77 for Attitudes and 0.87 for Behaviour. Respondents were also asked to indicate whether they were now performing the 12 previously rated conservation behaviours more than, less than, or the same as they had done before their visit.

Although most of the measures were developed specifically for this study, some were drawn from previous research by [author references withheld].
Data analysis

This paper focuses on the relationships within and between the three sets of variables (visitors’ entering attributes; salient aspects of the visitor experience; and short and long-term environmental learning and behavioural outcomes) using pooled data across the four sites. Detailed comparisons between the four sites, and in particular, between the two sites where animals were free to come and go in their natural habitat (in-situ wildlife tourism sites) and the two sites where the animals were contained within a built or artificial environment (ex-situ wildlife tourism sites) are presented elsewhere (author reference, in preparation), as is a qualitative analysis of visitors’ responses to the follow-up web surveys four months after the visit (author reference, in press).

Exploratory factor analyses were conducted within each of the three sets of variables (visitors’ entering attributes; aspects of the experience; learning and behavioural outcomes) in order to explore the structure of the data and construct new representative variables. These exploratory analyses were conducted on the portion of the sample that did not respond to the web survey. The variables constructed in this way were entered into a structural equation modelling analysis (conducted using the portion of the sample that responded at all three stages of data collection) in order to explore the relationships between and among the variables. Splitting the sample in this way enabled the factor structures identified in the exploratory analyses to be tested with a different sample as part of the Structural Equation Modelling analysis. The model was progressively refined by removing pathways that did not contribute significantly to the model.

Results

Exploratory factor analyses: visitor entering attributes

Visitors’ entering attributes (environmental interest, environmental knowledge, conservation behaviour and motivation for visiting) were all measured in the pre-visit questionnaire (N=1286). The exploratory factor analyses excluded those who had completed the web survey, leaving a sample of 1046.

Environmental Orientation

Environmental orientation included environmental interest, knowledge about wildlife conservation and engagement in environmentally responsible behaviours. As there were moderately strong correlations among these three variables, ranging from $r_{1172} = .41$ to $r_{1145} = .54$, factor analysis was used to explore the underlying structure. The 18 items were entered into a Principal Axis Factor Analysis with Varimax rotation. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy ($KMO = .904$) and Bartlett’s Test of Sphericity ($\chi^2$, 153 df = 5653.125, $p < .000$) confirmed that factor analysis was appropriate on these items. The results of the factor analysis are reported in Table 3. Three factors were extracted with Eigenvalues greater than 1, which together accounted for 42.5% of the common variance.
The interest and knowledge items, together with one behaviour item (Look for information about the environment on TV or other media) loaded onto one factor, which was labelled Environmental Curiosity. The remaining behaviour items split into two factors: Environmental Practices (conserving water, energy, recycling, collecting litter, purchasing environmentally friendly products) and Environmental Advocacy (talking to others about the importance of the environment, participating in a public land or water clean-up, doing volunteer work for a group that helps the environment, donating money to a nature or conservation organisation). Two items did not load on any of the factors (using “green” [non-plastic] shopping bags, and carpooling or driving a fuel efficient car). Scores were calculated for each of the three constructs by summing the items that loaded on each factor (all factor loadings were > 0.40 on the relevant factor, and < 0.40 on the other two factors; Cronbach alphas = .838, .705, .768 respectively).

Motivation for visiting
Packer’s (2004) Visitor Motivation Scale was used to measure the relative importance of each of four types of personal goals: learning and discovery, social contact, passive enjoyment and restoration. Scores were calculated for each factor by summing the relevant items (Cronbach’s alpha = .834, .841, .809 and .885 respectively).

Visitors’ entering attributes and demographic variables
Overall scores on the seven entering attribute variables are reported in Table 4. In general, visitors reported a high level of engagement in pro-environmental practices, a moderate level of environmental curiosity, and a low level of environmental advocacy. The dominant motivations were for enjoyment and for learning and discovery.

There were significant differences on five of the seven variables according to age (measured in 6 age groups from under 20 to over 60). Environmental curiosity, environmental practices, environmental advocacy and motivation for learning all increased significantly with age, F (5, 1189) = 6.447, p<.001; F (5, 1200) = 37.563, p<.001; F (5, 1225) = 5.534, p<.001; F (5, 1212) = 3.986, p=.001. In contrast, motivation for passive enjoyment decreased significantly with age, F (5, 1189) = 6.447, p<.001.

Approximately two-thirds of the questionnaires were completed by females. Females reported higher scores than males on five of the seven variables: environmental practices, F (1, 1179) = 10.778, p=.001; environmental advocacy, F (1, 1206) = 6.309, p=.012; motivation for learning, F (1, 1191) = 14.240, p<.001; motivation for passive enjoyment, F (1, 1186) = 19.163, p<.001; and motivation for restoration, F (1, 1182) = 17.664, p<.001.

Overall, 19% of the sample were visiting from overseas. There were no differences between Australian and overseas tourists in environmental curiosity or environmental advocacy. However, Australian visitors recorded higher scores on environmental practices
than overseas visitors, $F (1, 1011) = 28.215$, $p<.001$. Further analysis revealed that this was due to three practices in particular: conserving water, recycling and picking up other people’s litter. Australian visitors scored higher than overseas visitors on motivation for passive enjoyment, $F (1, 1020) = 42.810$, $p<.001$; motivation for restoration, $F (1, 1017) = 40.875$, $p<.001$; and motivation for social contact, $F (1, 1022) = 12.873$, $p<.001$. There was no significant difference between Australian and overseas tourists in the motivation for learning.

There were significant differences between first-time visitors (30% of the sample) and those who had been to the site before (70%) on five of the seven variables. Repeat visitors scored higher on environmental practices, $F (1, 1132) = 9.330$, $p=.002$ (in particular, on conserving water and recycling). As in previous research (Packer 2004), repeat visitors placed greater importance on social contact, passive enjoyment and restoration goals, $F (1, 1140) = 23.451$, $p<.001$; $F (1, 1145) = 31.741$, $p<.001$; $F (1, 1140) = 18.358$, $p<.001$ respectively, while first-time visitors placed greater importance on learning and discovery goals, $F (1, 1148) = 12.798$, $p<.001$.

**Visitors’ entering attributes and attrition**

Although a total of 1286 people accepted and completed the pre-visit questionnaire, only 173 (14%) of these completed all three stages of the research (see Table 1). There were no significant differences on any of the demographic variables between those who completed all three stages and those who didn’t. There were differences, however, in relation to environmental curiosity and motivation for enjoyment, $F (1, 1212) = 19.470$, $p<.001$; $F (1, 1235) = 4.586$, $p=.032$, respectively. In both cases, those who completed all three stages had higher scores than those who didn’t.

**Exploratory factor analyses: salient aspects of the visitor experience**

**Aspects of the visitor experience**

Aspects of the visitor experience were measured on the post-visit questionnaire (N=907) and factor analysed using the reduced sample of 734 (web survey non-participants). The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO = .900) and Bartlett’s Test of Sphericity ($\chi^2, 66 df = 2677.885$, $p <.000$) confirmed that factor analysis was appropriate on these items. The analysis produced two factors with eigenvalues greater than 1, which together accounted for 44.5% of the common variance. Six items had loadings greater than 0.40 on the first factor and five items on the second factor (see Table 5). The first factor included the excitement of seeing live animals, having a good view of the animals, seeing plenty of activity, having an engaging experience, having an enjoyable experience, and feeling a sense of wonder or awe. This was interpreted as Experiential Engagement. The second factor included feeling an emotional connection with the animals, reflecting on new ideas about animals and their environments, discussing new information with companions, experiencing something surprising or unexpected, and feeling sad or angry about environmental problems. This was interpreted as Reflective Engagement as these items all involved cognitive and/or affective processing of the experience. One item did not load definitively on either factor (the staff answered my questions). Scores were calculated for
each of the two Experience constructs by summing the items that loaded on each factor (Cronbach alphas = .868, .712 respectively).

Insert Table 5 about here

Aspects of the visitor experience and demographic variables
Overall scores on the two experience variables are reported in Table 6. In general, visitors reported a very high level of Experiential Engagement and a high level of Reflective Engagement. Visitors aged over 60 reported both types of experience more than younger visitors, F (5, 857) = 5.528, p<.001 for experiential engagement; F (5, 826) = 3.371, p=.002 for reflective engagement. Females reported both types of experience more than males, F (1, 854) = 26.634, p<.001: F (1, 823) = 18.630, p<.001, respectively. There were no significant differences between first-time and repeat visitors to the site or between Australian and international visitors on either Experiential Engagement or Reflective Engagement.

Insert Table 6 about here

Aspects of the visitor experience and attrition
There were no significant differences on either Experiential Engagement or Reflective Engagement between those who completed all three stages of the research and those who didn’t.

Short and long-term environmental learning outcomes
In an attempt to gain the best possible understanding of the impact of the wildlife tourism experience on visitors’ environmental knowledge, attitudes, behavioural intentions and actual environmental behaviour, a range of learning outcome measures were used both immediately after the experience (three short-term measures), and with a sub-sample of visitors who were followed up four months later (two long-term measures).

Short-term measures of environmental learning
The short-term measures of learning included: eight items measuring self-reported changes in environmental awareness, understanding, attitudes and concern; one item representing pre-post differences in self-rated knowledge about wildlife conservation; 15 items representing retrospective pre-post differences in environmental attitudes, self-efficacy and behavioural intentions. These items were entered into a Principal Axis factor analysis with Varimax rotation (KMO = .918; Bartlett’s χ², 276 df = 7721.843, p <.000). The single-item pre-post difference in self-rated knowledge of wildlife conservation, and one of the pre-post environmental attitude change items (“I feel helpless when it comes to helping nature”) had very low communalities (.059 and .111 respectively). These items were removed and the factor analysis was recalculated (KMO = .921; Bartlett’s χ², 231 df = 8008.111, p <.000). Three factors were extracted with eigenvalues greater than 1, together accounting for 50.4% of the variance (see Table 7). The three factors were interpreted as: Short-Term Impact
(self-reported changes in knowledge, understanding, concern and attitudes); Attitude Change – Conservation; and Attitude Change – Nature Appreciation (Cronbach alphas = .902, .876, .783 respectively).

Insert Table 7 about here

**Short-term learning and demographic variables**

Overall scores on the three short-term environmental learning variables are reported in Table 8. In general, visitors reported a high level of Short-Term Impact and a moderate level of Environmental Attitude Change. Visitors aged over 60 reported higher levels of Short-Term Impact than younger visitors, F (5, 837) = 5.187, p<.001 but less Attitude Change-Nature Appreciation, F (5, 772) = 2.274, p=.046. Females reported a higher level of Short-Term Impact than males, F (1, 834) = 17.778, p<.001. Repeat visitors reported higher levels of Attitude Change-Conservation and Attitude Change-Nature Appreciation than first-time visitors, F (1, 658) = 9.488, p=.002; F (1, 708) = 8.329, p=.004, respectively. There were no significant differences between Australian and international visitors on any of the measures of short-term environmental learning.

Insert Table 8 about here

**Short-term learning and attrition**

There were no significant differences on any of the measures of short-term learning between those who completed all three stages of the research and those who didn’t.

**Long-term measures of environmental learning.**

The two long-term measures (both collected by means of the follow-up web survey) included 12 items measuring self-rated changes in conservation behaviours and 3 items representing researcher-rated indices of the impact of the wildlife experience on visitors’ environmental knowledge, attitudes and behaviour (based on coding of qualitative responses). The correlations among these items were considered to be acceptable for factor analysis (KMO =.697; Bartlett’s $\chi^2$, 91 df = 567.018, p <.000). Three factors were extracted which together accounted for 32.2% of the common variance. The three factors were: Long-Term Impact (coded qualitative responses regarding environmental knowledge, attitude and behaviour changes); Behaviour Change-Environmental Practices; and Behaviour Change-Environmental Advocacy (Cronbach alphas = .606, .650, .557 respectively – all slightly less than the usually accepted level of .70).

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 Authorities vary as to whether .50, .60 or .70 is the appropriate minimum value for the KMO to be considered acceptable. Tabachnick and Fidell (2007) state that “values of .6 and above are required for good FA” (p614). A value of .697 indicates that the factors extracted will account for a reasonable amount of variance. The significant Bartlett’s test result confirms that the strength of the relationship among the variables is strong and appropriate for factor analysis.
Long-term learning and demographic variables

Overall scores on the three long-term learning variables are reported in Table 9. In general, there was a low level of long-term impact. Although long-term environmental knowledge gain was relatively high, only 7% of visitors were able to report a specific new environmental behaviour that they had adopted as a result of the visit and only 5% reported having questioned their values or changed their personal attitudes. There was a relatively high level of self-rated change in environmental practices, and a moderate level of self-rated change in environmental advocacy.

Insert Table 9 about here

There were no differences according to age on any of the long-term environmental learning measures. Females reported a higher level of Long-Term Impact than males, F (1, 231) = 7.543, p=.006. First-time visitors reported higher levels of Long-Term Impact and changes in Environmental Practices than repeat visitors, F (1, 238) = 3.987, p=.047; F (1, 238) = 4.957, p=.027, respectively. International visitors reported a higher level of Long-Term Impact and changes in Environmental Practices than Australian visitors, F (1, 195) = 5.704, p=.018; F (1, 195) = 5.931, p=.016, respectively.

Inter-relationships between the constructed variables

The exploratory factor analyses reported above produced a total of 15 new variables to represent the three sets: Visitors’ Entering Attributes; Visitor Experiences; and Environmental Learning Outcomes. In order to further reduce the number of variables to be included in the Structural Equation Modelling analysis, bivariate correlations between these 15 variables were calculated using the sample of 173 cases who had completed all three stages of the research. On the basis of these results, seven variables were selected that had significant inter-correlations with at least one item in each of the three sets. These were:

Visitor Entering Attributes
- Environmental Curiosity
- Environmental Advocacy
- Motivation for learning

Visitor Experiences
- Experiential Engagement
- Reflective Engagement

Environmental Learning Outcomes
- Short-Term Impact
- Long-Term Impact
When all cases with any missing data were removed (as required for Structural Equation Modelling), the number of cases fell to 154. According to Anderson and Gerbing (1988), a sample size of 150 should be sufficient for models with three or more indicators per factor. Confirmatory factor analysis was used to test the measurement models for (a) environmental orientation (including Environmental Curiosity and Environmental Advocacy); (b) motivation for learning; (c) visitor experiences (including Experiential Engagement and Reflective Engagement); and (d) short-term environmental learning. The measurement model for long-term environmental learning was not able to be tested as it had only three indicators and zero degrees of freedom. All of the measurement models were found to be acceptable (CMIN/DF < 3; CFI > .90; RMSEA < .10) with one minor adjustment – the item “I experienced something surprising or unexpected” was removed as an indicator of Reflective Engagement.

The initial structural model was based on the hypothesised model in Figure 1. However, Environmental Curiosity and Environmental Advocacy were found to be highly intercorrelated and some regression weights were greater than 1 (indicating a suppressor effect). The structural model was recalculated using first Environmental Curiosity, then Environmental Advocacy to represent environmental orientation. The model using Environmental Advocacy had similar goodness of fit indices, but accounted for a slightly higher percentage of the variance in Long-Term Impact than the model using Environmental Curiosity. Environmental Curiosity was thus removed from the model. All non-significant pathways were removed from the model in order to increase parsimony. The final model is presented in Figure 2.

As the AMOS Test for Normality indicated that the data violated the assumption of multivariate normality, the Bollen-Stine bootstrap modification was used to test for model fit. Goodness of fit indices were as follows: $\chi^2$ (396 df) = 655.59, corrected $p$-value with Bollen-Stine modification = .012; CFI = .874; RMSEA = .065. Tabachnick and Fidell (2007) suggest that “a good-fitting model may be indicated when the ratio of the $\chi^2$ to the degrees of freedom is less than 2” (p 715), and here this ratio was 1.656. Other indices were acceptable (RMSEA) or borderline (CFI). The model in Figure 2 was thus considered an adequate approximation of the relationships evident in the data.

The model in Figure 2 illustrates the extent to which the long-term impact of the visit could be predicted from measures of visitor entering attributes, visitor experiences and short-term learning outcomes. Environmental Advocacy, Motivation to Learn and Short-Term Environmental Learning were all significant predictors of Long-Term Impact (regression weights of .23, .23 and .29 respectively, Bollen-Stine adjusted $p = .048, .035, .009$). The visitor experience variable Reflective Engagement was a strong predictor of Short-Term Learning, which in turn was a weak predictor of Long-Term Impact. Experiential Engagement was important only in that it led to Reflective Engagement. Overall, the model in Figure 2 accounted for 31% of the variance in Long-Term Environmental Learning.
Discussion

The aims of this study were to investigate the relationships between three sets of variables – visitors’ entering attributes, salient aspects of the wildlife tourism experience, and learning outcomes based on short- and long-term changes in visitors’ environmental knowledge, attitudes, and engagement in environmentally sustainable practices. To this end, data were collected from over 1000 visitors to four different wildlife tourism attractions, using a wide range of dependent and independent variables before, immediately after, and four months after the visit. Data from the 173 participants who completed all three stages of the research were analysed using a range of techniques including Structural Equation Modelling.

Mostly, visitors were already engaged in lifestyle practices that were supportive of environmental sustainability, although few had taken an advocacy role such as talking to others about the environment or volunteering time or money to environmental causes. Older female visitors were more active in this regard than younger male visitors, and were also more likely to consider the wildlife tourism experience as a learning opportunity. The older female group subsequently reported higher levels of short-term learning, but this advantage did not persist over the long term.

Australian visitors and repeat visitors were more likely than overseas visitors and first-time visitors to engage in sustainable environmental practices before the visit. This is interesting in light of Lucas and Ross’s (2005) suggestion that pre-visit differences between first-time and repeat visitors should be expected if the experience was effective in eliciting long-term changes. Following this reasoning, this finding provides further evidence for the long-term impact of wildlife tourism experiences. After the visit, however, overseas and first-time visitors reported significantly greater long-term environmental learning than Australian and repeat visitors.

The final structural model presented in Figure 2 provides a graphical representation of the relationships that were evident in the data. It suggests that entering attributes such as pre-visit engagement in high commitment environmental advocacy behaviours are strong predictors of the long-term impact of a wildlife tourism experience. In some ways this is disappointing, as it gives credence to the criticism that such experiences are only “preaching to the converted”. More promising is the important role played by entering motivation. Entering motivations can be influenced by how a site is marketed, thus this relationship represents a potential area where wildlife tourism sites could have an influence on the public’s long-term environmental learning outcomes (cf., Falk, 2009). Also encouraging was the evidence that engaging in a reflective or contemplative experience made a significant contribution to short-term learning, which in turn was a significant but weak predictor of long-term impact. Reflective engagement, which involved both cognitive and affective processing of the experience, was more strongly associated with learning outcomes than the immediate but fleeting excitement of seeing the animals, although this excitement was instrumental in eliciting a reflective response.
The results indicate that tourism managers can optimise the long-term impact of a wildlife tourism experience by encouraging visitors to emotionally connect with the animals they are observing, respond thoughtfully to the threats facing these animals, reflect on these ideas and discuss them with their companions. Similar conclusions arose from a qualitative analysis of visitors’ memories of their experience [author reference, in press a]. Marketing strategies that emphasise the pro-conservation elements and educational opportunities offered as part of the experience will help to prepare visitors for maximum gain, as well as adding value to the experience in the eyes of many potential visitors (Ballantyne, Packer and Hughes, 2008).

The finding that a relatively small proportion of the variance in long-term environmental learning could be accounted for by the visitor experience and short-term learning variables measured in this study suggests that further research is needed to identify specific actions wildlife tourism providers can take to ensure that the immediate effects of the experience are maintained and strengthened in the long-term. In the present study, the retention of new knowledge and understandings appeared to outlast actual changes in attitudes and behaviour. The provision of post-visit ‘action resources’ that focus on behavioural rather than cognitive outcomes may help to rectify this. The use of such resources to encourage the translation of behavioural intentions into real actions, as suggested by Ballantyne and Packer (2009c), is a strategy that needs further examination in terms of its potential contribution to the long-term behavioural impact of a wildlife tourism experience.

Although not able to be empirically tested in the present study, it is possible to imagine the models in Figures 1 and 2 as a continuous cycle – the long-term impact of one visit increases the visitor’s entering level of environmental orientation for their next visit, either to the same site or a new experience. Wildlife tourism managers should thus consider themselves part of a large network of educators, with a long-term vision and shared goals regarding their potential impact.

This was an ambitious project and as such, was subject to several limitations. A certain degree of sampling bias could not be avoided due to the high degree of attrition across the three stages of the project, although this appeared to be impacting the short-term measures more than the longer-term measures. It is, however, acknowledged that even the pre-visit sample may have been biased towards those more committed to and interested in environmental concerns. The final modelling analysis was conducted on a relatively small sample, and the model’s goodness-of-fit to the data was borderline on some indices. However, triangulation with the qualitative analysis reported elsewhere (author reference, in press a), contributes to our confidence in the findings. In particular, the emergence of “reflective engagement” as a key theme in visitors’ memories of and responses to their experiences demonstrates its importance as a predictor of both short- and long-term environmental learning. Further research is needed to continue to develop reliable and valid measures of short and longer-term visitor learning outcomes, to identify aspects of the visitor experience that are effective in bringing about long-term learning and environmental behaviour change, and to develop strategies for increasing the positive long-term impacts of
wildlife tourism experiences on visitors’ actions in support of the environment (author reference, in press b).

Acknowledgements
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References


Rennie, L.J. and Johnston, D.J. (2007). Visitors’ perceptions of changes in their thinking about science and technology following a visit to a science center. *Visitor Studies, 10* (2), 168-177.


Figure 1. Hypothesised model of inter-relationships among the variable sets
Figure 2. Structural equation model predicting follow-up learning outcomes

Predicting long-term environmental learning from visitor attributes, experiences and short-term learning (n=154)
<table>
<thead>
<tr>
<th></th>
<th>Aquarium</th>
<th>Marine Theme Park</th>
<th>Turtle nesting</th>
<th>Whale watching</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-visit</strong></td>
<td>294</td>
<td>236</td>
<td>452</td>
<td>304</td>
<td>1286</td>
</tr>
<tr>
<td><strong>Post-visit</strong></td>
<td>258 (88%)</td>
<td>225 (95%)</td>
<td>142 (31%)</td>
<td>282 (93%)</td>
<td>907 (71%)</td>
</tr>
<tr>
<td><strong>Web survey</strong></td>
<td>30 (10%)</td>
<td>58 (25%)</td>
<td>110 (24%)</td>
<td>42 (14%)</td>
<td>240 (19%)</td>
</tr>
<tr>
<td><strong>Completed all three stages</strong></td>
<td>29 (10%)</td>
<td>58 (25%)</td>
<td>45 (10%)</td>
<td>41 (14%)</td>
<td>173 (14%)</td>
</tr>
</tbody>
</table>

Note. The large variation between sites in % return rate of post-visit questionnaires is a function of the variation in data collection procedures, which in turn was a result of logistical issues.

Table 1. Questionnaire responses by site and research stage
<table>
<thead>
<tr>
<th>KNOWLEDGE</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>No change/ no impact</td>
<td>Reinforced existing knowledge</td>
<td>Increased awareness; general statement of increased knowledge; awareness of physical characteristics of animals</td>
<td>Specific statement of new knowledge or understanding; critical thinking</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ATTITUDES</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>No change, negative attitude</td>
<td>Reinforced existing positive attitudes</td>
<td>Increased concern or interest; changed general attitudes; statements of what “others” should do (e.g., government)</td>
<td>Questioned values, changed personal attitudes; desire to defend or protect</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BEHAVIOUR</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>No change/ no impact; makes excuses; expresses anti-conservation sentiments</td>
<td>Already committed</td>
<td>Behavioural intentions (want to, recognise need to) regarding specific behaviours (as distinguished from general attitudes)</td>
<td>New behaviours (e.g., donate money, pick up litter) that visitor has done themselves</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Criteria used to code qualitative responses
<table>
<thead>
<tr>
<th>Activity</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interested in learning about environmental issues</td>
<td>.808</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Often think about whether my actions harm the natural world</td>
<td>.667</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actively search for information about wildlife conservation</td>
<td>.664</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enjoy spending my leisure time observing animals</td>
<td>.663</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enjoy watching TV documentaries about wildlife</td>
<td>.536</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-rated knowledge about wildlife conservation</td>
<td>.481</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Look for information about the environment on TV or other media</td>
<td>.446</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participate in a public land/water clean-up</td>
<td></td>
<td>.790</td>
<td></td>
</tr>
<tr>
<td>Do volunteer work for a group that helps the environment</td>
<td></td>
<td>.742</td>
<td></td>
</tr>
<tr>
<td>Donate money to a nature or conservation organisation</td>
<td></td>
<td>.456</td>
<td></td>
</tr>
<tr>
<td>Talk to others about the importance of the environment</td>
<td></td>
<td>.416</td>
<td></td>
</tr>
<tr>
<td>Conserve energy at home or work</td>
<td></td>
<td></td>
<td>.613</td>
</tr>
<tr>
<td>Conserve water in the home and garden</td>
<td></td>
<td></td>
<td>.609</td>
</tr>
<tr>
<td>Purchase products that are environmentally friendly</td>
<td></td>
<td></td>
<td>.544</td>
</tr>
<tr>
<td>Recycle bottles, cans and paper</td>
<td></td>
<td></td>
<td>.479</td>
</tr>
<tr>
<td>Pick up other people’s litter</td>
<td></td>
<td></td>
<td>.415</td>
</tr>
<tr>
<td>Carpool or drive a fuel efficient car</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use “green” (non-plastic) shopping bags</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Rotated factor matrix – environmental orientation (loadings < .40 suppressed)
<table>
<thead>
<tr>
<th></th>
<th>Sample Mean</th>
<th>% scoring high (at least 4.0 on a 5-point scale)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Practices</td>
<td>3.72</td>
<td>40%</td>
</tr>
<tr>
<td>Environmental Curiosity</td>
<td>3.28</td>
<td>16%</td>
</tr>
<tr>
<td>Environmental Advocacy</td>
<td>2.25</td>
<td>4%</td>
</tr>
<tr>
<td>Motivation for Enjoyment</td>
<td>3.60</td>
<td>51%</td>
</tr>
<tr>
<td>Motivation for Learning and Discovery</td>
<td>3.59</td>
<td>41%</td>
</tr>
<tr>
<td>Motivation for Restoration</td>
<td>3.21</td>
<td>28%</td>
</tr>
<tr>
<td>Motivation for Social Contact</td>
<td>2.54</td>
<td>7%</td>
</tr>
</tbody>
</table>

Note. Mean scores below 3.0 are considered “low”; 3.0-3.5 “moderate”; 3.5-4.0 “high” and above 4.0 “very high”.

Table 4. Descriptive statistics for visitor attribute variables (all means have been pro-rated to a 5-point scale for the purpose of comparison).
Table 5. Rotated factor matrix – aspects of the experience (loadings < .40 suppressed)
<table>
<thead>
<tr>
<th>Engagement</th>
<th>Sample Mean</th>
<th>% scoring high (at least 4.0 on a 5-point scale)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiential Engagement</td>
<td>4.44</td>
<td>86%</td>
</tr>
<tr>
<td>Reflective Engagement</td>
<td>3.73</td>
<td>38%</td>
</tr>
</tbody>
</table>

Note. Mean scores below 3.0 are considered “low”; 3.0-3.5 “moderate”; 3.5-4.0 “high” and above 4.0 “very high”.

Table 6. Descriptive statistics for visitor experience variables
My visit has made me more concerned about the well-being of wildlife in general
I feel more strongly about wildlife conservation issues as a result of my visit
My visit has made me more concerned about the well-being of these animals in particular
The experience has made wildlife conservation issues more meaningful to me
I have a better understanding of conservation issues because of my visit
The experience has made me more interested in these animals
Some of my beliefs have changed as a result of my visit
I have learnt some new facts or information during the visit
Change Score: I want to do everything I can to protect and conserve wildlife
Change Score: There is a lot I can do to conserve
Change Score: I understand the impact of my actions on the environment
Change Score: I am interested in finding out more about wildlife conservation
Change Score: I am part of the solution to nature’s problems
Change Score: I do my best to avoid doing things that might hurt or destroy an animal’s habitat
Change Score: I know some things I can do to help protect wildlife
Change Score: We have the responsibility to leave healthy ecosystems for our families and future generations
Change Score: Nature helps define Australia’s national heritage and character
Change Score: We need to help protect animals
Change Score: We need to help protect animal habitats
Change Score: Animals are amazing
Change Score: Nature is a place to renew the human spirit

Table 7. Rotated factor matrix – short-term learning outcomes (loadings < .40 suppressed)
<table>
<thead>
<tr>
<th>Sample Mean</th>
<th>% scoring high (at least 4.0 on a 5-point scale)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-Term Impact</td>
<td>3.70</td>
</tr>
<tr>
<td>Attitude Change-Conservation</td>
<td>3.43</td>
</tr>
<tr>
<td>Attitude Change-Nature Appreciation</td>
<td>3.39</td>
</tr>
</tbody>
</table>

Note. Mean scores below 3.0 are considered “low”; 3.0-3.5 “moderate”; 3.5-4.0 “high” and above 4.0 “very high”.

Table 8. Descriptive statistics for visitor experience variables. (The attitude change scores have been converted to a 5-point scale for the purpose of comparison; scores below 3 indicate average negative change; 3 = average no change; above 3 = average positive change.)
<table>
<thead>
<tr>
<th>Sample Mean</th>
<th>% scoring high</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-Term Impact</td>
<td>2.38 (on a 4-point scale)</td>
</tr>
<tr>
<td>Environmental Knowledge</td>
<td>3.17</td>
</tr>
<tr>
<td>Environmental Attitude</td>
<td>2.33</td>
</tr>
<tr>
<td>Environmental Behaviour</td>
<td>1.62</td>
</tr>
<tr>
<td>Behaviour Change-Environmental Practices</td>
<td>3.60</td>
</tr>
<tr>
<td>Behaviour Change-Environmental Advocacy</td>
<td>3.15</td>
</tr>
</tbody>
</table>

Note. On the 4-point scale, mean scores below 2.5 are considered “low”; 2.5-3.0 “moderate”; 3.0-3.5 “high” and above 3.5 “very high”. On the 5-point scale, mean scores below 3.0 are considered “low”; 3.0-3.5 “moderate”; 3.5-4.0 “high” and above 4.0 “very high”.

Table 9. Descriptive statistics for visitor experience variables. (The behaviour change scores have been converted to a 5-point scale for the purpose of comparison; scores below 3 indicate average negative change; 3 = average no change; above 3 = average positive change.)