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RESEARCH ARTICLE

The Elephant Queen: Can a nature documentary help to increase tolerance towards elephants?

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Abstract

1. Conflict between humans and elephants is one of the more complex examples of human-wildlife conflict, a key challenge for wildlife conservation. While interventions exist to separate humans from elephants, few exist aimed at bringing the two species closer together.

2. This study assesses if a natural history film, The Elephant Queen (TEQ), makes communities living around elephants more tolerant of conflict with elephants. Questionnaires and interviews were conducted before and after seeing the film screened on a mobile cinema in Southern Kenya. A double robust ordinal regression analysis using 357 matching specifications to measure the effect size of viewing TEQ on the six criteria identified as being drivers of tolerance of a wild animal by the Hazard Acceptance model.

3. This study found that students aged between 16 and 18 gained knowledge (mean effect size = 0.27) and affection (mean effect size = 0.17) towards elephants and felt the benefits of elephants more keenly (mean effect size = 0.26) following viewing TEQ. Community members aged between 16–80 also gained knowledge (mean effect size = 0.21) and saw the benefits of elephants (mean effect size = 0.15) but felt the costs of living with elephants more profoundly after viewing TEQ (mean effect size = −0.11). After 90 days a follow-up survey also showed a significant increase in community "affection" towards elephants (mean effect size = 0.11), however the costs, benefits and knowledge gained had been reduced to a statistically insignificant level compared to baseline.

4. Our results suggest that natural history films can serve as a valuable tool in inspiring young minds. When shown to an adult audience, changes were more nuanced and some of the changes were short lived (<3 months).

KEYWORDS
behaviour change, coexistence, documentary, hazard-acceptance model, human-elephant conflict, *Loxodonta africana*, The Elephant Queen

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B. Mwalavu and G. Serem contributed equally to this study.

1 | INTRODUCTION

We are at a pivotal time for our planet, with the natural world facing degradation at unprecedented rates with no sign of abatement (Barnosky et al., 2011; Powers & Jetz, 2019). Overconsumption of resources combined with increasing human population densities has resulted in habitat loss at rates that nature can no longer adapt to and in turn the level of conflict between humans and wildlife has never been greater (Abrahms, 2021). This conflict is considered to be one of the most urgent and complicated issues within nature conservation today (Frank et al., 2019). The people most at risk of conflict are often the most marginalised. National parks can be large enough to house conflict species but their presence remains a double edged sword preventing communities accessing firewood and other resources from the park (Dickman et al., 2013). The rural buffer zones between communities and parks are therefore often an area of hostility with wildlife, with a level of conflict being unavoidable.

One of the more complicated forms of human-wildlife conflict is that between elephants and the rural communities within Africa that live alongside them (Hoare, 2015). Human-elephant conflict (HEC) takes many forms, from death and disability of humans and elephants to loss of crops, livestock, water, infrastructure and even the emergence of communities unable to live without the fear presented by one to the other (Mumby & Plotnik, 2018). For humans, the consequences of this negative socio-economic human-elephant interaction are often paired with, or even worse triggers, extreme poverty, psychiatric issues and substance abuse (Jadhav & Barua, 2012), which exacerbates the impact of the conflict event further (Nyumba et al., 2020; Sampson et al., 2019). When these socio-economic clashes at the house-hold level are combined with local climatic issues like droughts and floods HEC seems destined to get cyclically worse unless this bond can somehow be reconciled (Shaffer et al., 2019).

Within the complex issue of HEC a range of management strategies exist that can reduce the physical and mental burden of elephants (Shaffer et al., 2019). These tools include farm boundary protection methods (e.g. beehive fences King et al., 2009, 2010, 2017), the farming of non-palatable crops (Hedges & Gunaryadi, 2010), electric fences and the use of lights/fire (Davies et al., 2011). There is an abundance of psychological theory that conservation can learn from (St John et al., 2011) but changing attitudes and social norms alongside giving communities the skills and hardware to change their behaviours is a challenging task. While film can play a part in this as a visible awareness raising and training tool, the exact role of natural history film as a method for behaviour change is largely unstudied.

The power of film to initiate changes in attitudes and behaviour is hotly debated and generations of impactful films where impact is left unproven has planted seeds of doubt as to their true impact (Jones et al., 2019; Karlin & Johnson, 2011). There are signs that documentaries and other animal imagery can have positive impacts on viewers (Beattie et al., 2011; Males & Van Aelst, 2021; Thomas-Walters et al., 2020). Studies have shown that viewing *Cowspiracy* can reduce ones intentions to eat meat (Pabian et al., 2020). In one study, *Blue Planet II* was found to increase knowledge, but it did not translate into a willingness to pay to change the status quo (Hynes et al., 2021) or change viewers actual behaviours (Dunn et al., 2020). Such films have however been shown to create connections between the audience and nature, increasing awareness even beyond the content of the show in some cases (Fernández-Bellon & Kane, 2020). Films can also have huge impacts on corporations; *Blackfish* triggered a decrease in attendance and consequently initiated the declining market value of SeaWorld (Boissat et al., 2021). *The Cove* and *Bold Native* were found to only really have an impact on those who were likely to make changes prior to seeing these films (Newman, 2015). There are certainly questions surrounding whether documentaries displaying "pristine nature" may in fact mislead audiences into the belief that nature is doing well (Jones et al., 2019). As a result, audiences may feel we are not in need of global behaviour changes in order for nature to continue delivering the ecosystem services humanity depends upon. Global behaviour changes are hard to initiate and the tools by which to conduct conservation behaviour changes are in short supply.

This study attempts to qualify and quantify the impact of a mobile cinema taking *The Elephant Queen* (TEQ) to rural communities across Kenya facing the threat of HEC. TEQ is a 96-min award winning cinematic, natural history documentary narrated in Kiswahili, Maa and English. The film does not directly address poaching or conflict with elephants but rather immerses the audience in the lives of Athena, the matriarch and her family. It reveals the complex life of elephants, their struggles to find water and the long journeys they undertake for survival alongside their role as architects of the environment and pivotal to the lives of many other species. The film is dedicated to Satao, an iconic Kenyan Great Tusker who appears in the film and was subsequently killed by poachers in 2014 and Athena who went missing during the filming of TEQ. These dedications are the only reference to poaching in the film and are designed to work by shocking the audience. While the narrative does not delve into conservation issues, the directors hope that by seeing elephants in their natural habitat away from conflict zones viewers might come to understand the empathetic and intelligent nature of elephants.

2 | METHODS

This study took place between the beginning of November 2021 and the end of June 2022 and surrounded the impact of a mobile cinema and engagement programme screening *TEQ* to rural communities around south-eastern Kenya. It targeted communities surrounding National Parks and known to suffer from high levels of HEC. Questionnaires and interviews were identified as the best ways to understand both quantitative results of the study as well as the background regarding a community's relationship with elephants and recording more qualitative impacts of TEQ (Figures 1 and 2).

FIGURE 1 Stills from The Elephant Queen showing iconic tusker Satao who was killed in 2014 (a) and the films protagonist, Athena and her family (b) © Deeble & Stone 2017. Researchers carrying out questionnaires at a community (c) and school (d) screening © Alfred Simatwa. The set-up showing typical community (e) and school (f) screenings.

FIGURE 2 The study area showing the specific locations where The Elephant Queen was screened for community and school audiences throughout the Shimba Hills/South Coast region (pilot study), Arabuko-Sokoke Forest, Tsavo and Amboseli regions.
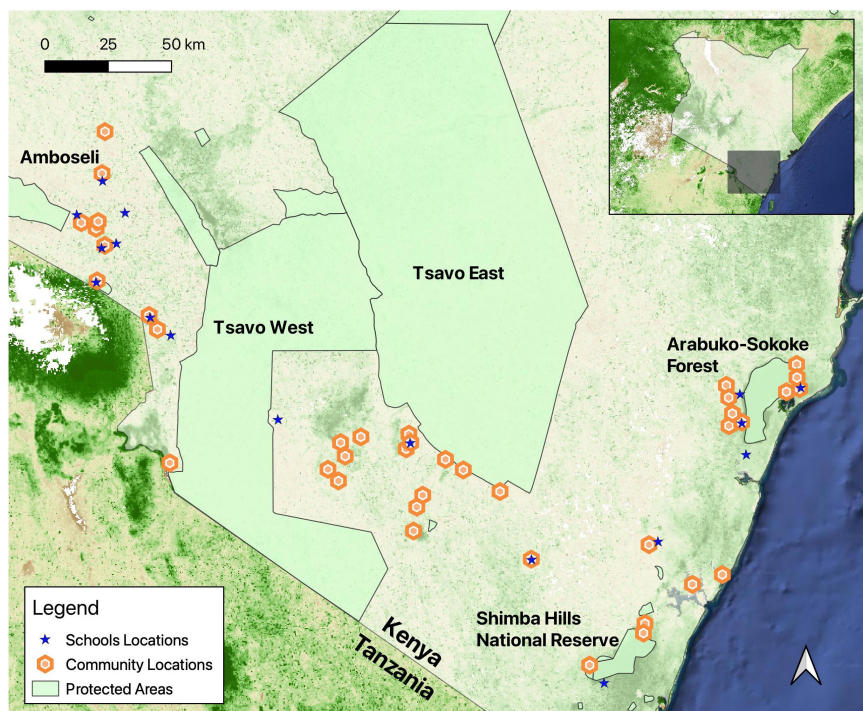
2.1 | Questionnaire design

The study used the Before-After-Control-Impact experimental design collected longitudinally directly before viewing, directly after viewing and 90 days after viewing TEQ (Figure 3). The questionnaires were administered in Kiswahili by Kiswahili speaking enumerators and genders of participants were matched to those of administrators. The sampling was non-random quota-based sampling with equal numbers of males and females surveyed from four age categories (16–28, 29–41, 42–54 and 55 and above). Each researcher

Community Study

Comparison group

Snakebite Awareness

TSAVO · AMBOSELI · ARABUKO → Adults

1. Pre-intervention questionnaire
Directly prior to activity

2. Snakebite Awareness activity

3. Post-intervention questionnaire
Directly after screening

4. Follow-up questionnaire
Approx 12 weeks after screening

End of study

Study group
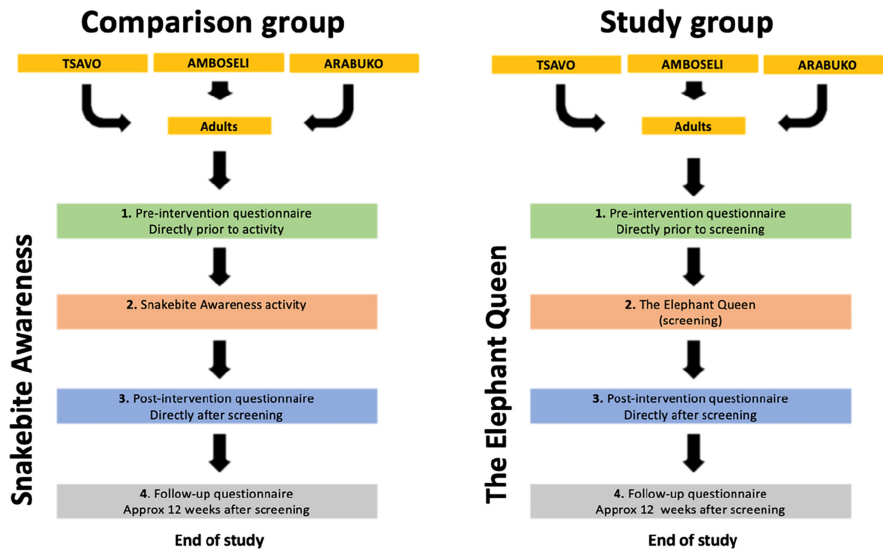
The Elephant Queen

TSAVO · AMBOSELI · ARABUKO → Adults

1. Pre-intervention questionnaire
Directly prior to screening

2. The Elephant Queen
(screening)

3. Post-intervention questionnaire
Directly after screening

4. Follow-up questionnaire
Approx 12 weeks after screening

End of study

School Study

Comparison group

Snakebite Awareness

TSAVO · AMBOSELI · ARABUKO → Students

1. Pre-intervention questionnaire
Directly prior to activity

2. Snakebite Awareness activity

3. Post-intervention questionnaire
Directly after screening

Study group

The Elephant Queen

TSAVO · AMBOSELI · ARABUKO → Students

1. Pre-intervention questionnaire
Directly prior to screening

2. The Elephant Queen
(screening)

3. Post-intervention questionnaire
Directly after screening

**FIGURE 3** Study design for the community ($n=545$) and school ($n=642$) elements of the study.
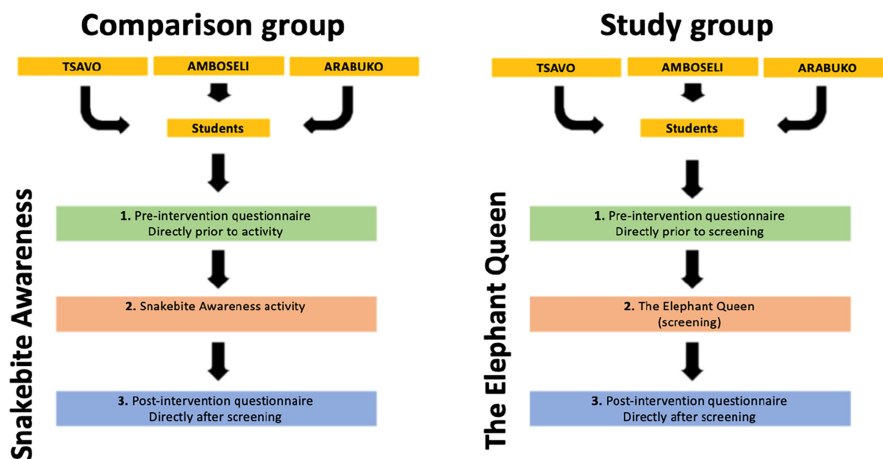
was given two age categories within their gender from which to get one study and one comparison participant in each. The sample size was determined based on constraints upon the team: a crowd rarely gathered earlier than 1 h prior to the screening; questionnaires took approximately 10 ± 3 min per person; recruiting and conducting the comparison also limited time available for the questionnaires and due to logistics limitations, the team was limited to five people including four researchers and the educator carrying out the comparison activity. The target was to recruit eight people for the study group and eight people for the comparison group at each community location, however occasionally this target was missed, or respondents would leave before completing the post-questionnaire.

Those having seen TEQ prior to our event were excluded from the study as were those under the age of 16. At secondary school locations 40 student (20 for the comparison and 20 for the study group) participants (16–18 years) were recruited and the comparison was carried out prior to TEQ viewing allowing all comparison participants to also enjoy watching TEQ (this was possible due to the lack of follow-up for the student study). The questionnaires (see

Supporting Information S1) were made up of 60 questions in the pre-questionnaire, 46 in the post-questionnaire and 40 in the follow-up questionnaire. The questionnaires had open-ended sections on demography, true/false/I do not know section on knowledge and 5-point Likert scale questions on the hazard-acceptance model (Bruskotter & Wilson, 2014) (Figure 4): (i) control over elephants; (ii) authority management of elephants (social trust); (iii) affect towards elephants; (iv) negative impacts of elephants and (v) benefits of elephants (see Supporting Information S1 for the full questionnaires). This wildlife tolerance focused adaptation of the hazard acceptance model is generally considered to portray socio-ecological systems accurately (Pooley et al., 2021; Struebig et al., 2018) and much support is lent to the use of hazard acceptance models in tolerance for wildlife by research on those living with carnivores (Slagle et al., 2012; Zajac et al., 2012). The questionnaire also contained a qualitative section at the end pertaining to enjoyment and feelings about TEQ itself (post-questionnaire only). To control for the impact of the film we set up a comparison activity done either prior to viewing TEQ in the case of secondary schools or taking place simultaneously to TEQ in the

FIGURE 4 A wildlife tolerance model adapted from Bruskotter and Wilson (2014) showing the different elements of their original model with our inclusion of knowledge within this and direct effects between these actors.
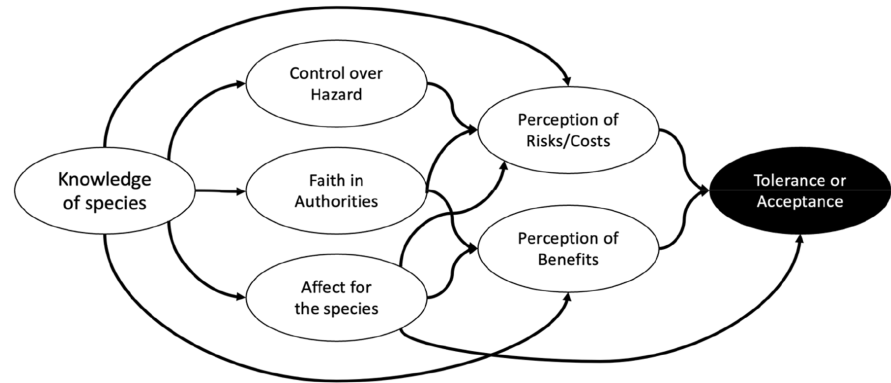
case of communities. This was to prevent any comparison participants viewing any of TEQ and enabling follow-up questionnaires to be undertaken successfully. Questionnaires were developed using Esri's Survey123 app and data collected on smart phones.

2.2 | The comparison activity

The comparison activity consisted of a snake and snakebite awareness activity conducted by an employee of East African Venom Supplies (formerly BioKen). The activity included videos shown on a laptop, some basics to snakebite identification and a Q&A session. This was chosen as a comparison group as it also involves a conflict animal and a focus on nature as well as providing a benefit to the community in the form of better information of what to do in the case of snakebites. Snakes are a high conflict animal in Kenya that take many lives every year (estimated to be 0.7% of all deaths, Snow et al., 1994). Participants of both the comparison and study groups were compensated with a small bag of sugar (~500 g) as a 'thank you' for their time without potentially setting a dangerous precedent for other researchers to follow with cash incentives.

2.3 | Semi-structured interviews

Alongside the questionnaires, we conducted semi-structured interviews (n = 20) with individuals in each area in order to ascertain background information on the status of HEC within that community as well as perceived impact of TEQ by community leaders. These leaders were made up of Chiefs (n = 3), Assistant Chiefs (n = 4), Community Elders (n = 8), KWS Wardens/Assistant Wardens (n = 2) and senior NGO officials (n = 3). Wherever such individuals were available following a screening an interview was undertaken (see interview guide in Supporting Information S2).

2.4 | Pilot study

Between the 5th and 15th November 2021, a pilot study was carried out in the area surrounding Shimba Hills National Reserve on the south coast region of Kenya. Interviews with community leaders were

carried out there (n = 4) and five community venues were studied using questionnaires alongside one secondary school in order to finalise wording of questionnaires, practice the methodology behind participant recruitment and become familiar with conducting the comparison activity. Data collected during the pilot was not included in the study.

2.5 | Follow-up study

After 90 days participants from the community study were rung using phone numbers given during the pre-questionnaire. Individuals that were unable to be reached were re-called for 10 days at different times of day to maximise their ability to answer the call before a participant was classified as unreachable.

2.6 | Ethics statement

This study was approved by Pwani University Ethical Review Committee (Kilifi, Kenya. Ref: ERC/EXT/001/2021, see Supporting Information S3). We obtained prior informed consent from all interviewees and questionnaire respondents, the information sheet for which can be found in Supporting Information S4.

2.7 | Analysis

We ran a double robust ordinal regression analysis predicting the impact of viewing *TEQ* on the range of indicators that make up the Hazard-Acceptance Model (Bruskotter & Wilson, 2014). We controlled for several demographic covariates including livelihood, gender, tribe, age and education among others (see Supporting Information S5: Table S1 for rationale). As we used a matching approach to estimate a counterfactual, we explored different matching options and report the range of effect sizes that resulted. We matched directly on covariates, but explored multiple matching algorithms (genetic matching, optimal full matching and direct mahalanobis), callipers where applicable (0.25 SD and 1 SD), replacement/non-replacement and with different numbers of matches using one or two nearest neighbours where applicable. We removed each covariate in turn from the specification to control for their individual

impact on the matching process. This culminated in a total of 358 different specifications. We selected covariates based on a theory of change for TEQ (see Figure 5). The primary covariates used in the matching were location (which of the three study regions we were in), tribe, age, main source of income, level of education, whether they have suffered losses to elephants, distance to a national park, help from local organisations (Likert response used), wealth (area of family land used as a proxy). Additionally, we considered several secondary covariates of which we incorporated precipitation, gender, household size, frequency of elephant sightings, perceived risks (Likert response used) into our specifications. All models controlled for the respondent's attitude towards nature using a short five question section of Likert style responses.

We deviated from the pre-registration (AsPredicted #88670) in some variations in matching methods used (Stuart et al., 2011). Exact and coarsened exact matching gave no matches as matching was

done using too many covariates leaving us to exchange entropy balancing for Optimal Full Matching alongside the genetic matching and mahalanobis distance matching stipulated in the pre-registration. Regressions were then carried out using each fully matched dataset. Cumulative link mixed effects models were undertaken using the ordinal package (Christensen & Christensen, 2015) and all 357 matching specifications were used for each of the three data sets: pre- and post- data for community screenings, pre- and follow-up data for community screenings and pre- and post-data for secondary school screenings. In some cases, inclusion of a random effect led to a singular variance–covariance matrix of the parameters and termination of the optimizer. In these cases, the random effect was removed, and a cumulative link model was instead used. Effect sizes were then calculated using the effectsize package in R (Ben-Shachar et al., 2020). A result was considered significant if over 50% of models calculated a p-value below 0.05.
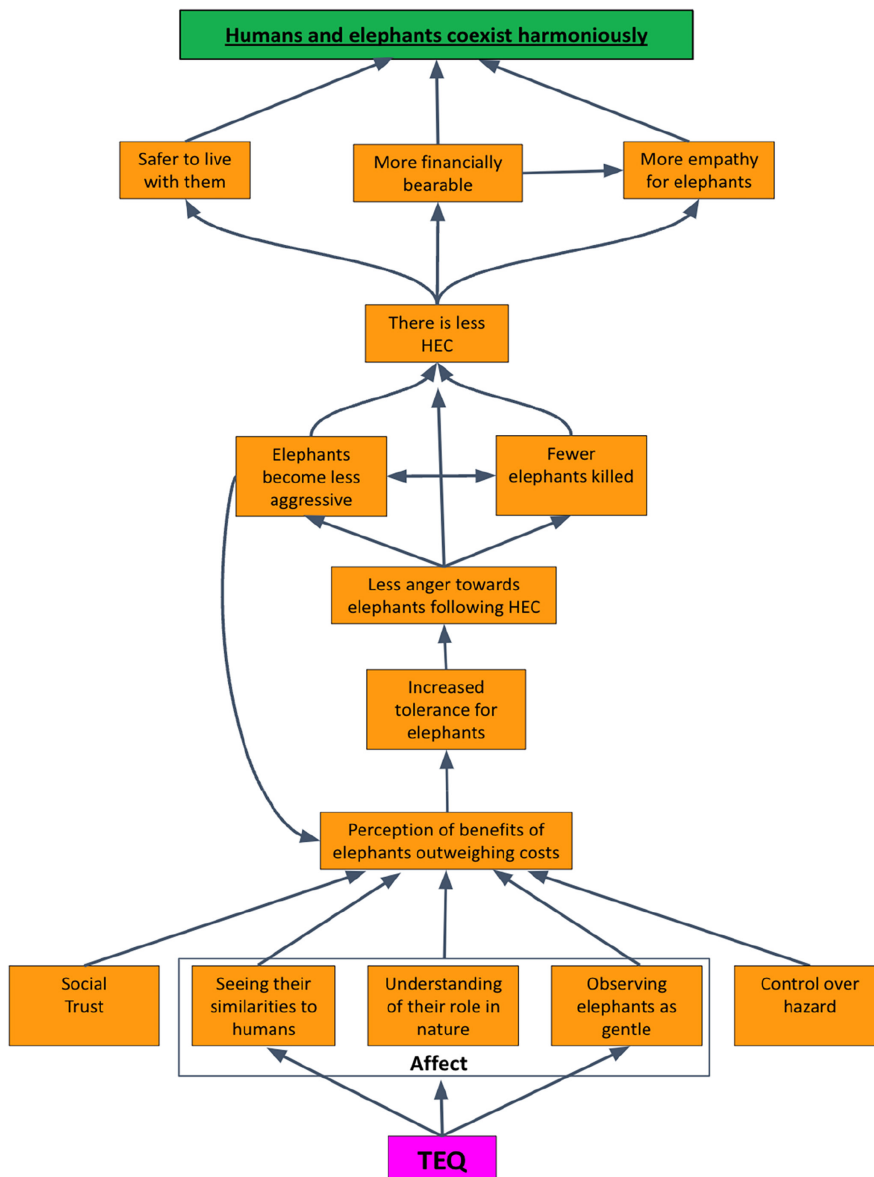

FIGURE 5 A theory of change for The Elephant Queen (TEQ) set within the hazard acceptance model. HEC, human-elephant conflict.

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3 | RESULTS

3.1 | Main study

Between 24 November 2021 and the 30 June 2022 TEQ mobile cinema travelled between three major regions of southern Kenya. Our study team pursued the mobile cinema collecting data along the way. Across these three regions we studied 37 community screenings ($n=545$ questionnaires) and 16 secondary school screenings ($n=642$ questionnaires) as well as conducting 20 individual interviews with community/program leaders. Between the 24 November and 9th December 2021 the Mobile Cinema was rolled out to communities surrounding the Arabuko-Sokoke forest on the Kenyan Coast, here 10 communities ($n=149$ questionnaires) and four secondary schools ($n=158$ questionnaires) were studied as well as four interviews being undertaken. From the 31 January to the 28 February 2022 the mobile cinema moved to the Tsavo Region of Southern Kenya where 18 communities ($n=253$) and four secondary schools ($n=150$) were studied and 10 interviews were conducted. Finally, from the 3rd of May to the 30th of June 2022 the mobile cinema moved to the Amboseli region of Kenya where 9 communities ($n=136$) and eight secondary schools ($n=312$) were studied, and six interviews were undertaken. In total 59 screening sites were included in the study and a total of 1245 pre-questionnaires were collected and 1201 post-questionnaires (losing 44 respondents or 3.5% in the process). With community respondents a follow up questionnaire was attempted 90 days following the screening to which 381 of the 545 community respondents were re-recruited (losing 164 respondents or 30% in the process).

3.2 | Affect towards elephants

Directly after watching TEQ, affect, or affection towards elephants based on mean effect size was found to decrease (mean effect size=−0.07). However, most specifications found this result not to be statistically significant with just 37 models (10.4%) giving a p-value below 0.05. After 90 days this initial change in affect towards elephants turned into a positive, statistically significant (182 specifications or 51%) effect size of 0.11 (Figure 7d). A positive increase in affective terms was also seen with school student viewers of TEQ and a statistically significant (345 or 96.6% of specifications) mean effect size of 0.17 resulted (Figure 8a), though this was only seen immediately after the screening due to no follow-up questionnaire being possible for students.

3.3 | Faith in authorities

Faith in Authorities was found to increase mildly following viewing TEQ (mean effect size=0.04), most specifications found this non-significant with just 17 or 4.8% of specifications showing significance. In the follow up there was also no change in audiences' faith

in authorities with a mean effect size of 0.026, an effect size that was found significant by just 3 or 0.84% of the specifications. The student's faith in authorities was also unaffected by viewing TEQ with a non-significant effect size of −0.08, just 99 specifications or 27.7% found this to be significant.

3.4 | Benefits from elephants

The audience perception of benefits from elephants (this included benefits to tourism, ecosystem health and quality of life) clearly increased with a mean effect size of 0.15, this was also found to be statistically significant by 321 of the specifications (89.9%) (Figure 7a). These initial increases to perceived benefits were lost after 90 days giving a non-significant effect size of −0.022 which only 5 or 1.4% of specifications calculated as significant. Students perceived benefits from elephants increased significantly following TEQ viewing with a mean effect size of 0.26 which was found to be statistically significant by 330 or 92.4% of specifications (Figure 8b).

3.5 | Control over elephants

The audiences perceived control over elephant behaviour increased with a small mean effect size of 0.03 following viewing TEQ and just 11 (3.1%) specifications found this to be statistically significant. This result was similar in the follow up with a non-significant mean effect size of 0.085 that just 47 or 13.2% of specifications found to be statistically significant. Student viewers saw no significant change to their perception of control over elephants with a mean effect size of 0.07, found significant by only 41 or 11.5% of specifications.

3.6 | Cost of living with elephants

The perceived costs of living with elephants increased with a statistically significant mean effect size of −0.11 (the negative is a result of all positive scores showing affirmative changes towards tolerance). Of the 357 specifications 207 found this to be a statistically significant change (57%) (Figure 7b). This initial increase in perceived costs became a decrease after 90 days where the mean effect size became 0.085, however this was not considered statistically significant as just 76, or 21.3% of specifications calculated it to be. The student viewers perceived costs of living with elephants decreased in contrast to adult viewers however this was not statistically significant (63 or 17.6% of specifications) and gave a low mean effect size of 0.068.

3.7 | Knowledge of elephants

Viewing TEQ saw a positive change in viewers knowledge of elephants with a statistically significant (353 or 98.9% of specifications)

mean effect size of 0.21 (Figure 7c). This increase in knowledge between the control and treatment group became non-significant in the follow up with a mean effect size of 0.056, considered non-significant due to only 78 or 21.9% of specifications finding it to be significant (Figure 8f). Like adult viewers the students' knowledge increased from watching TEQ with a highly statistically significant (357 or 100% of specifications) mean effect size of 0.27 (Figure 8c).

From the qualitative questionnaire data, audiences clearly enjoyed the film (just one viewer in 574 claimed not to) and believe it can have an impact: over the two groups 86.7% felt TEQ changed their attitude towards elephants. On average 79% of viewers believed the film would change their interactions with elephants in the future and 88.4% of viewers felt the film could change their whole community's relationship with elephants. Those doubting the impact of the film stated the danger, destruction and poverty caused by elephants, as well as a lack of direct benefits from the film as the impediments to impact. The elements of the film driving this were identified as primarily the compassion of elephants: their family bond, unity, care for other animals, creation of waterholes and the human elements again such as mourning and leadership from Athena. Of the 36.2% of community viewers and 47.6% of school viewers who became fearful of losing elephants from watching TEQ, drought was mostly to blame (85.9%), followed by poaching (7.8%) and not being cared for (6.3%). Viewers thought they would be most likely to tell non-viewers about the importance of elephants to humans and the ecosystem at large as well as to protect them and how enjoyable, interesting, and educative the film was (see Supporting Information S7: Table S2 for further information).

The communities we visited varied greatly in terms of the types of conflict they suffered, with the Arabuko-Sokoke forest area suffering more from snakes than elephants. Amboseli respondents suffered less wildlife conflict compared to the other two locations, but the bulk of that conflict was to elephants. Crop raiding was the most common form of HEC throughout the three locations second to vegetation destruction and water point damage in Tsavo (see Supporting Information S7: Table S3 for further information).

4 | DISCUSSION

Our study provides evidence that films like TEQ can have a positive conservation impact within marginalised rural communities grappling with HEC. Knowledge transfer was particularly effective among both adult and student viewers of TEQ. It was therefore surprising to see that after 90 days this knowledge in adult viewers had been eroded in the community follow up and the effect had diminished to non-significant levels. However, on closer inspection of this data the major factor is that the comparison groups' knowledge of elephants actually increases. While the specific mechanisms of influence remain uncertain it is plausible that the dissemination of knowledge and attitudes towards elephants from viewing TEQ occurred through social learning processes. Viewers who watched the film may have engaged in conversations with their peers, including those

in the control group. This interpersonal communication, a key aspect of Bandura's social learning theory (Bandura & Walters, 1977), could have facilitated the diffusion of information and positive attitudes towards elephants. It is also possible that these discussions among young and old are what led to the surprising increase in "affection" towards elephant seen 90 days after the original screening and that viewing TEQ had primed them for increasing affection towards elephants during these discussions.

Not all responses to the film were positive however, with one elder having the following insight, *It brings knowledge, but it cannot change the behaviour because we still feel hatred toward elephants because of the pain of killing people and destroying our farms, so we don't love the elephants at all.* While there might be some truth in this for a very select few viewers, longer term the film did cause an increase in general community affection towards elephants (mean effect size = 0.11) and certainly from the qualitative data most viewers seemed to think it would change the way they interact with elephants on an individual and community level in the future. The response was slightly different between adult and student audiences (see Figure 6) and although student and adult viewers exhibited increased knowledge and a clearer understanding of the benefits of elephants after viewing the film. Students showed a more pronounced immediate shift in their affection towards elephants (see Figure 6) which may be attributed to their relatively limited personal experiences with HEC.

The questionnaire in this study was based on the hazard-acceptance model which had been modified for wildlife tolerance (Bruskotter & Wilson, 2014). For the purpose of this study, we included knowledge within our questionnaire design as we considered it a key part of changes in attitude. While our data does not reveal any statistically significant changes in the three criteria assumed to influence the perceived costs and benefits, our findings demonstrate statistically significant increases in knowledge as well as perceived costs and benefits. This suggests that enhancing knowledge plays a crucial role in fostering species tolerance (Figure 4) as other studies before us have also concluded (Dickman, 2010; St John et al., 2012).

For a rural Kenyan audience, sitting for 96-min of viewing is a less common activity. It was sometimes perhaps too long for viewers, with audience members leaving before the end. Although mothers needing to tend to children and viewers needing to protect their farms from elephants were also known explanations. It is possibly the saliency of this extended silent sitting and dwelling on elephants for such a time that could have caused the small (and notably non-significant) decrease in affect seen in communities following viewing. It is also possible that this extended sitting is what caused the increases in perceived costs of living with elephants that we found community audiences to undergo from watching the film. But importantly the perceived benefits also increased. An Assistant Chief commented, *When I spoke to the people, many have seen the importance of wildlife and how they can benefit from them although they are destructive.*

Although it is widely accepted that automated interpretation of effect sizes is not recommended (Kelley & Preacher, 2012), there
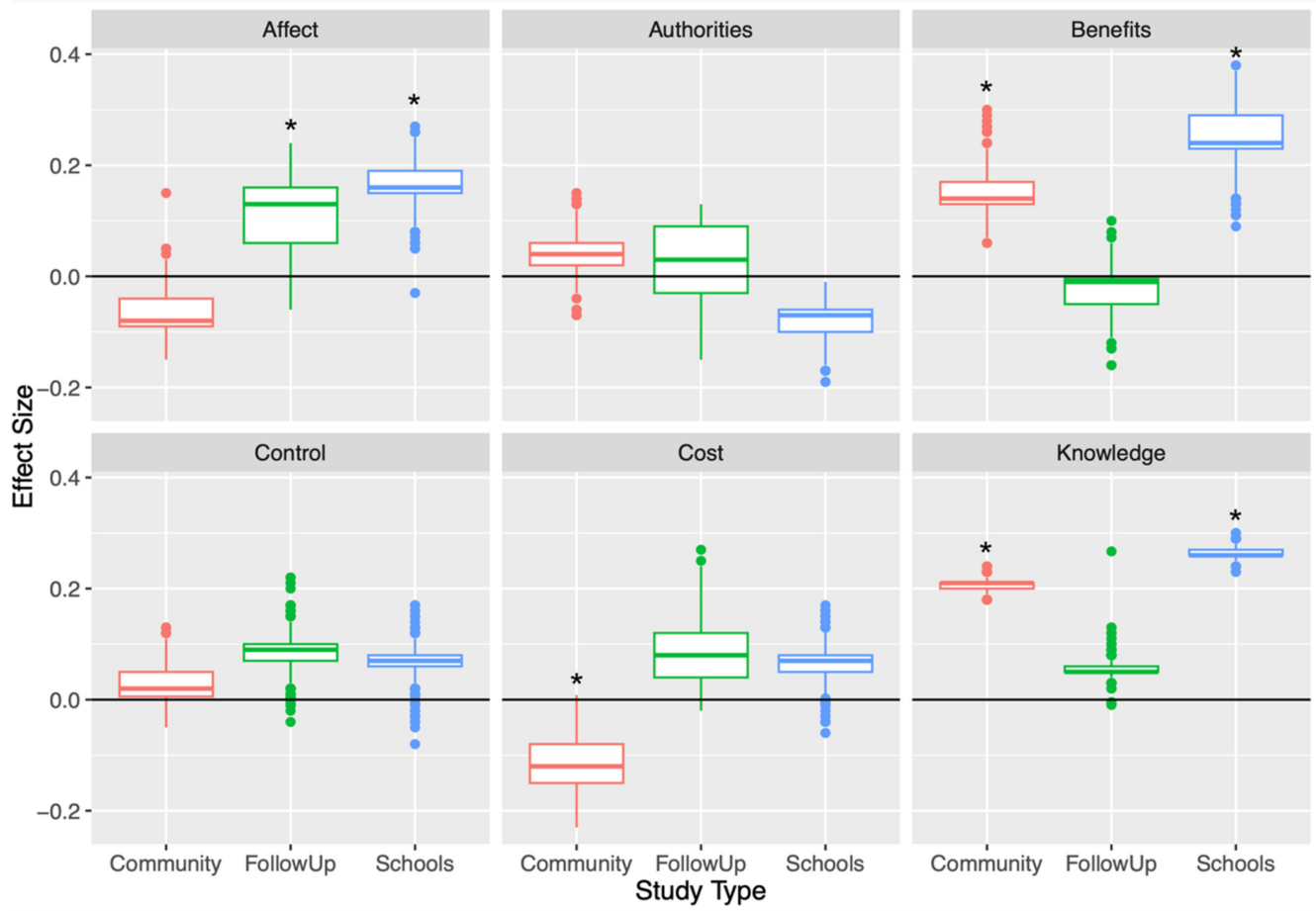
FIGURE 6 A summary of the effect sizes seen over all three study groups (expanded specification charts seen in Figures 7 and 8) and for all five tolerance criteria and knowledge. See Figures 6–8 for abridged specification charts. Presence of * represents more than 50% of specifications showing statistical significance of result rather than displaying level of significance.

is general agreement that some rules of thumb can help gauge relative magnitude of these effect sizes. Cohen suggests using 0.15, 0.25 and 0.4 respectively to indicate small, medium and large effect sizes (Ben-Shachar et al., 2021). It is worth bearing in mind that large effect sizes are often associated with serious overestimates in Psychological research (Funder & Ozer, 2019). Either way, the magnitude of the effect from watching TEQ is fairly small nonetheless it is indicative of a shift in a positive direction. Given that the baseline attitudes towards elephants were already favourable, the opportunity for a dramatic change was inherently limited. Similarly, viewers had a good baseline knowledge of elephants, with pre-viewing scores of 71% correct (this went up to 82% post-viewing). So, the opportunity for the film to have a large effect size on these factors was limited. It is positive to see that even in communities suffering death and destruction to elephants, a generally positive view towards them remains as a core base value.

There seems to be little doubt from most viewers that TEQ had an impact on them and they believe it can have a wider impact on their communities' relationship with elephants. From the interviews it was clear that people felt the impact of TEQ is primarily visually educative and as one elder put it *This is a type of education that can't*

escape from the mind because it is education through seeing. There was a slight mistrust towards other education programmes to convince communities to coexist with elephants, one assistant chief said *You find that when you haven't seen anything they might have a biased say on it but when they see it like in this film they will know the truth and have knowledge about it.* This seems to be an undercurrent known to the authorities, with one senior Kenya Wildlife Service warden saying *These films are of big importance because it is not something that someone can say they have been lied to, it is something that can be seen.* Another Assistant chief again referred to the importance of seeing in believing: *We Africans learn from seeing. They have seen that elephants are not problematic. All they do is to search for food and water and then they proceed on their way. They have no issues with humans.* This concept of seeing something has important implications for conservation awareness activities that rely on spoken and written words alone.

From the qualitative questionnaire data, it is clear that audiences enjoyed the film (just one viewer of the 1187 in the study claimed not to) and believe it can have an impact, over the two groups 86.7% felt it could. Those doubting the impact of the film stated the danger, destruction and poverty caused by elephants, as well as a lack
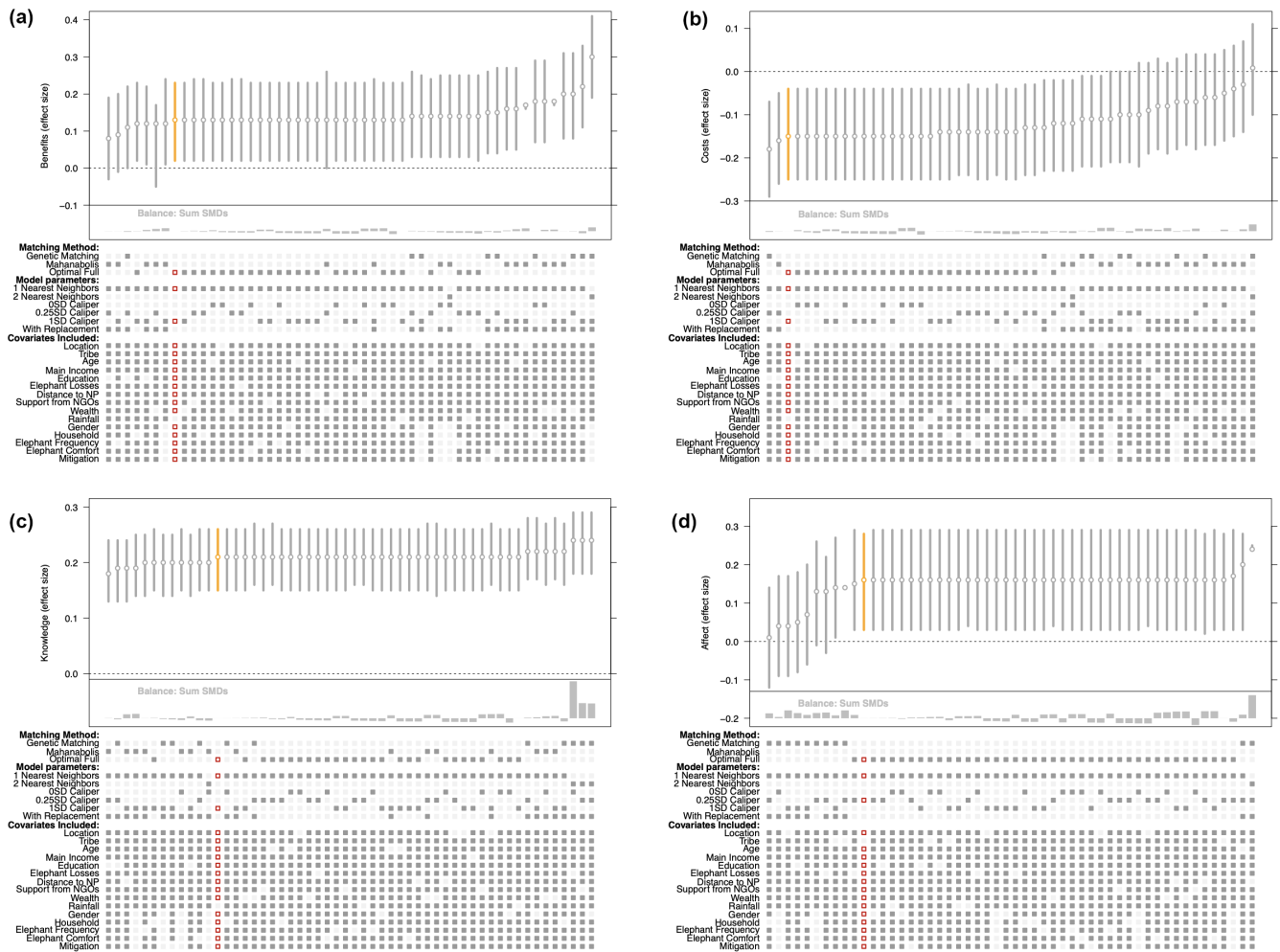
FIGURE 7 Significant effects of viewing The Elephant Queen (TEQ) on community audiences. Specification charts showing immediate effect sizes of the different sections of the questionnaire following viewing of TEQ by community members aged 16–80: (a) benefits, (b) costs, (c) knowledge as well as the only significant follow-up result, (d) affect. These specification charts show the 50 models with the best balance as calculated using the sum of their standardised mean deviation. The model with the lowest standardised mean deviation is highlighted and the models with the greatest and lowest effect sizes were added to show the full breadth of effect sizes. The full 357 effect sizes can be found in Supporting Information S9 and S10. (Error bars, 95% CIs).

of direct benefits from the film, such as methods for reducing HEC. A common reaction to TEQ is noticing the similarities between humans and elephants, and many of their human traits were the most favoured moments in the film: mourning, caring for young ones and leadership from Athena. Despite this, the similarity between humans and elephants was a concept verbalised by just 8.9% of community members and 3.8% of school children.

There was an interesting division between interviewees, with many feeling that TEQ had brought them solutions for coexisting with elephants: *This film has educated us on how to live with elephants and this makes us happy because some of us we have never had a privilege to watch films and we have seen that elephants also mourn when one of their family members dies*.—Elder. While others, despite enjoying the film, finished it wanting solutions: *But again we would like to request for help on how to live with the elephants*.—Elder. While TEQ successfully improved attitudes towards elephants, it did not offer specific solutions to HEC. Future work could focus on assessing the

impact of a film explicitly designed to address HEC mitigation strategies, potentially providing a more holistic approach to mitigating HEC, for example by using Save the Elephants new HEC toolbox (Onserio & King, 2023). Any future study should also attempt to disentangle the covariates and the differing impact such a film could have on different subgroups.

In conclusion, TEQ has demonstrated its value as a conservation tool and potentially more importantly filling the hole left by storytelling which rapid westernisation is carving away (Michuki, 2020). Bringing communities together to speak about a subject, hearing a diversity of views and allowing people to make more informed decisions regarding issues. Storytelling was once key to shaping folklore and taboos that maintain the human-nature balance in much of the world (Colding & Folke, 2001; Riley, 2010) and while bringing it back is not easy, modern equivalents must be identified if a healthy status quo between humans and nature is to be rediscovered. *During the old days of our forefathers people knew how to communicate with the*
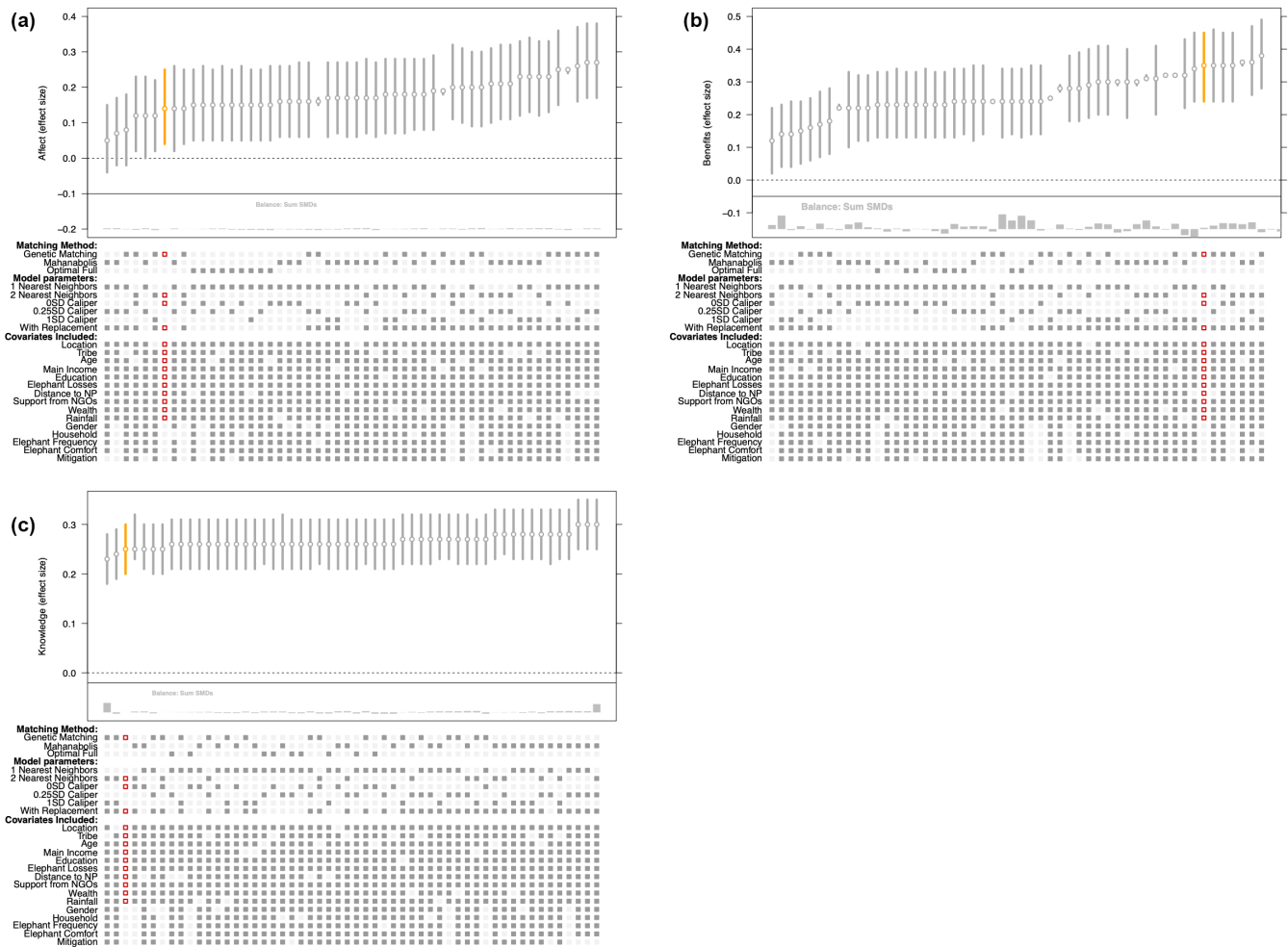
FIGURE 8 Effect of viewing The Elephant Queen (TEQ) on a student audience. Specification charts showing effect sizes of the sections of the questionnaire showing a statistically significant effect following viewing of TEQ by students aged 16–18: (a) affect, (b) benefits and (c) knowledge. These specification charts show the 50 models with the best balance as calculated using the sum of their standardised mean deviation. The model with the lowest standardised mean deviation is highlighted and the models with the greatest and lowest effect sizes were added to show the full breadth of effect sizes. The full 357 effect sizes can be found in Supporting Information S11. (Error bars, 95% CIs).

elephants and they could peacefully pass with no harm. Unlike in our generation now people have forgotten our cultures and they really don't know how to interact with wild animals.—Village Elder.

AUTHOR CONTRIBUTIONS

Harry Fonseca Williams and Diogo Verissimo conceived the ideas and designed methodology alongside Lucy E. King and Frank Pope; Kennedy L. Leneuiyia, Brayn Mwalavu, Gladys Serem and Virginia Sempeyo collected the data; Harry Fonseca Williams analysed the data alongside Diogo Verissimo, Kennedy L. Leneuiyia, Brayn Mwalavu, Gladys Serem and Virginia Sempeyo; Harry Fonseca Williams led the writing of the manuscript. All authors contributed critically to the drafts and gave final approval for publication.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

All data have been made readily available along with any scripts and code at https://osf.io/cnx29/. Feel free to reach out to the contributing authors for anything further.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

Appendix S1. The questionnaire used in the study.