



Educational briefings in touristic facilities promote tourist sustainable behavior and customer loyalty

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ABSTRACT

Ecotourism gives tourists the opportunity to improve knowledge and awareness of environmental issues while on vacation. Recreational environmental education has been proven an effective method to raise perception of human impact on ecosystems. "Glocal Education" is an education project aimed at developing environmental interest in tourists on vacation. The present study assessed the effectiveness of Glocal Education in improving tourist environmental interest. Using specific questionnaires, we evaluated project impact on tourists, tourist satisfaction regarding the project and customer loyalty towards the tour operator hosting the project. The study took place at three mass touristic facilities, where tourists were asked to fill a questionnaire before and after participating in educational activities (e.g., biology lessons, excursions). The average score of both questionnaires was then compared to evaluate possible improvement of tourist knowledge, attitude and awareness. Results showed that such activities had a significantly positive impact on tourist knowledge, attitude and awareness at all localities. High levels of satisfaction and loyalty towards the host tour operator were observed at all sites, which indicate that once a person is briefed about the correct approach to natural systems, they can become increasingly interested in taking action, developing an "advocate" role. This study shows how informal education activities can act as trigger for environmental awareness and behavior among tourists, providing them with the tools, knowledge, and motivation to critically discern what is and isn't environmentally friendly, not only in terms of products and services in their everyday life, but also when choosing their vacation spots.

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1. Introduction

Tourism is currently the world's third largest export category. Since the global economy crisis in 2009, the tourism market has been continuously growing (World Tourism Organization UNWTO, 2017). Furthermore, 2018 saw the highest growth in worldwide international trips since 2010, with a total of 1.3 billion tourists, 7% more than in 2017 (World Tourism Organization UNWTO, 2018). For over 60 years, the tourism industry has been an ever-growing worldwide activity, and while it contributes to society with revenue for the global workforce, it can also impact natural resources and ecosystem services (Holden, 2016), from land and water use to biodiversity loss (Tolvanen and Kangas, 2016) and greenhouse gas emissions (Gössling and Peeters, 2015). It is of interest for the tourism industry to find sustainable ways to use natural systems (European Union Business and Biodiversity Platform, 2010) given the fragile balance that natural destinations survive on. Tourism destinations are often based on benefits from the natural landscape; consequently, environment degradation would bring negative consequences to the tourism sector (Lenzen et al., 2018).

Ecotourism is meant to be a sustainable form of nature-based tourism, preserving biological diversity, maintaining sustainable use of resources, promoting environmental appreciation to travelers and bringing economic benefits for the industry. Ecotourism can also promote the well-being of local communities, promoting local participation and learning experiences (Kiper, 2013). Furthermore, when paired with first-hand experience and environmental education to contextualize the importance of given ecosystem or wildlife species (wildlife tourism), ecotourism encourages the tourist to take action in promoting ecosystem conservation, going as far as to educate other people on the importance of the subject (Ballantyne et al., 2011; Tisdell and Wilson, 2001). Such behaviors are likely to create empathy and enhanced understanding of the delicate balance that nature thrives upon, hence generating social and economic benefits (Buultjens et al., 2016; Tisdell and Wilson, 2001; Ziegler et al., 2018) and thus ensuring that businesses keep profiting and the environment is preserved in the long run (Branchini et al., 2015a; Meschini et al., 2021). However, learning experiences that happen in an informal and carefree setting tend to educate people more than in formal settings, such as in the school environment (Bueddefeld and Van Winkle, 2018), and can also translate to more adequate behavior, reinforcing conservation efforts made by the population surrounding natural areas (de la Torre and Yépez, 2003; Padua, 1994). It is argued that “free-choice” environmental learning experiences, where individuals are in control of their own learning, might promote environmentally sustainable attitudes and behavior, such as increase in empathy, motivation or change in perceptions, lifestyle changes, talking to others about environmental issues, joining volunteer programs, or donating to environmental organizations (Ballantyne and Packer, 2005, 2011).

To promote sustainable behavior through informal education activities, the Marine Science Group, a research group at the University of Bologna, created the Glocal Education project. Glocal Education is an environmental education project aimed to influence the degree of tourists' environmental knowledge, attitude and awareness through recreational activities during their vacation. Project main goals are: 1) creating a training program aimed at increasing environmental education in tourists; 2) studying the effects of the training program on tourist environmental knowledge, attitude and awareness towards the environment in the short and long term; 3) evaluating tourist appreciation for the educational program and whether this affects the level of customer loyalty towards the brand hosting the research project, (i.e., tourist willingness to travel to other destinations, and even pay extra, based on the preference for the tour operator promoting the environmental education project). In the present study, three mass touristic facilities were employed to perform the first stage evaluation (short-term) of the Glocal Education project, assessing: 1) the difference in environmental knowledge, attitude, awareness, and customer loyalty before and after participation in project activities; 2) the influence of

demographic factors (sex, age, education and nature contact) not only on the initial level of environmental knowledge, attitude and awareness, but also on their short-term improvement; 3) the degree of tourist satisfaction regarding participation in the project.

2. Method

2.1. The Glocal Education project

Project activities were carried out at three mass touristic facilities managed by Francorosso, a tour operator specialized in package holidays under the Italian Alpitour S.p.A group, operating worldwide. The facilities were in the localities Nosy Be (Madagascar), Dhiggi and Maayafushi (The Maldives). Upon their arrival, tourists were asked by the Glocal Education biologist to take part in the project. The Glocal Education biologists were BSc or MSc students in biological or natural sciences at the University of Bologna, selected by the Marine Science Group based on their interest and experience in environmental education and previously trained based on the activities to be performed at the touristic facilities and the content covered by the questionnaires.

In case tourists were interested in participating in the Glocal Education Project, the first questionnaire, here referred to as questionnaire T₀, was provided before the first scheduled environment-related activity with the biologist onsite, to assess the environmental background of each tourist. After completion of the T₀ questionnaire (Fig. 1a), tourists were invited to take part in any of the proposed activities, as follows:

- A one-hour introductory lesson focused on island geology, coral reef formation and coral biology (Fig. 1b and 1c);
- An “around-the-island” interactive walk, with explanations on local fauna and flora (Fig. 1d and 1e);
- A further one-hour biology lesson focused on the identification and general biology of local organisms (marine invertebrates, fish, marine reptiles and mammals in the Maldives, and both terrestrial and tropical plant species in Madagascar) (Fig. 1f and 1g);
- Participation in field excursions accompanied by the Glocal Education biologist and local guides. Specifically, snorkeling excursions were organized at the Maldives facilities, and excursions through the primary forest at the facility in Madagascar (Fig. 1h-1k).

All project activities were carried out at least once a week. Tourists could decide freely to attend all or some of the activities. Participation in at least one Glocal Education activity was mandatory to consider the tourist eligible for the Glocal Education project data collection. After conclusion of the last proposed activity, eligible tourists were asked to fill the second questionnaire, here referred to as questionnaire T₁ (Fig. 1l).

2.2. Questionnaire evaluation

The questionnaires were developed by the Department of Psychology of the University of Bologna. Questionnaire T₀ consisted of two parts. Part 1 contained tourist personal data (Fig. A1 in Appendix A), as reported in Table 1. Part 2 contained a series of items, to be answered by the participating tourist, which correspond to the 4 variables knowledge, attitude, awareness, and customer loyalty (Table 2, Fig. A2-A6 in Appendix A). Questionnaire T₁ was also divided in 2 parts. Part 1 asked how many project activities were attended by the tourist during their stay at the touristic facility and part 2 was the same as questionnaire T₀, with the addition of a 5th variable: tourist satisfaction, which accounts for appreciation of the Glocal Education project (Table 2, Fig. A7 in Appendix A). Tourists could indicate only one answer for each item.

The knowledge variable score was calculated by giving the value 0 if the answer was wrong, +2 if it was correct and +1 if it was “I don't know”, with a total maximum score of the variable being 20. For the remaining variables (attitude, awareness, tourist satisfaction and



Fig. 1. Glocal Education project activities. Some examples of activities performed by the Glocal Education biologists onsite, at Nosy Be (Madagascar), Dhiggiri and Maayafushi (Maldives): evaluation questionnaires (a and l); biology lessons (b, c, f and g); field excursions (d, e, h, i, j and k). Pictures are freely available on the Glocal Education Project website: <http://glocaleducation.eu/>.

Table 1

Demographic variables. Personal data requested in part 1 of the questionnaire T₀ and grouping levels of the factors considered in the statistical analysis.

Factor	Questionnaire answers	Level	N ^a		
			Nosy Be	Dhiggiri	Maayafushi
Sex	Male	Male	183	407	251
	Female	Female	259	475	276
Age	Under 15	Under 30	97	183	103
	16–30				
	31–45	31–45	142	325	179
	46–60	Over 46	203	374	245
Education	Over 60				
	Elementary school	High school diploma	272	530	305
	High school				
	Undergraduate degree	College degree	170	352	222
	Master's degree Ph.D.				
Nature contact	Up to three times a year	Non-naturalist	268	544	331
	At least once a month				
	Up to three times a month	Naturalist	174	338	196
	At least once a week				
	More than once a week				
Total			442	882	527
				1851	

^a Number of participating volunteers in each locality.

Table 2

Questionnaire variables. List of variables in Part 2 of the questionnaires used for project effectiveness assessment, followed by the number of items included for measuring its score and description of the topic each variable was designed to cover. Tourist satisfaction variable was present only in the T₁ questionnaire.

Variable	Number of items	Description
Knowledge	10	Basic coral reef biology and ecology of the maldives/endemic fauna and flora of Madagascar
Attitude	8	Behavioral intentions towards the environment and the project
Customer loyalty	5	Customer loyalty towards the brand hosting the research project
Awareness	9	Personal opinion about actions that may or may not impact the local environment
Tourist satisfaction	11	Tourist evaluation regarding project activities and identification with project goals

customer loyalty), each item could be answered according to a Likert scale (Joshi et al., 2015), ranging from 1 to 5: 1: Strongly disagree, 2: Disagree, 3: Neutral, 4: Agree, 5: Strongly agree. Negatively worded items (reverse items) were reverse scored to make the answer consistent with the other items within the same variable.

After all the questionnaires were recorded into a Microsoft Access database, answers were divided according to each variable (knowledge, attitude and awareness, here called sustainability variables) from which, for each tourist, we calculated a sum score for the knowledge variable, and a mean score for the attitude and awareness variables at T₀ and T₁. We then rescaled all sustainability variable scores to a scale of 10.

The set of items pertaining to the tourist satisfaction variable comprised different topics to be evaluated by the tourist, such as appreciation of the project, identification to project goals and willingness to hire the tour operator again in the future. Since the grouping of such items might have resulted in a biased variable analysis, each of the items was analyzed individually. As for the customer loyalty variable, each item regarded different levels of customer loyalty as it relates to the

project: 1. Loyalty to the tour operator hosting the project; 2. Loyalty to the presence of a biologist on site; 3. Loyalty to nature-based activities at the touristic facility. Furthermore, each item inquired how much the tourist was willing to spend besides the standard holiday package prices in order to enjoy such accommodations/activities, and so all the items were also analyzed individually.

2.3. Statistical analysis

2.3.1. Reliability analysis

In order to measure the reliability of tourists' answers in terms of internal consistency within the attitude and awareness variables, (i.e., how tourists' answers within a variable are correlated), a Cronbach's alpha (α) correlation (Peterson, 1994) was conducted using IBM SPSS Statistics version 22. In fact, in case of evidence of relationship, a mean score value could be used as representative for the whole variable, instead of the scores for each separate item of that variable.

2.3.2. Sustainability variable analysis

The distribution of variable scores did not meet the assumptions of normality (Kolmogorov-Smirnov test) and equal variance (Levene's test) and differences among factors were thus analyzed using a permutational multivariate analysis of variance (PERMANOVA), which does not require homogeneity of variance or normal distributions (Anderson et al., 2008). We used the R software (R Development Core Team, 2019) to run a preliminary PERMANOVA, so as to assess if the sustainability variable scores (knowledge, attitude and awareness) presented significant differences among the three localities, in which case, they would be analyzed separately.

We performed a PERMANOVA to compare the scores of sustainability variables (knowledge, attitude and awareness) among factor levels. The design considered the factor time (to compare the variable scores at T₀ with those at T₁) and four demographical variables (sex, age, education and nature contact) nested in the factor time. This design assessed possible differences before- vs after-project activities and checked whether demographical factors influenced the sustainability variables scores. Tests were run using Euclidean distance matrices among samples and 999 permutations in the software Primer v6 – Quest Research Limited (Anderson et al., 2008).

For this study, tourist data were not collected anonymously (name and surname were requested) to guarantee the comparison between the initial environmental education assessment and that after participation in project activities. We have treated the data confidentially, exclusively for institutional purposes (art. 4 of Italian legislation D.R. 271/2009 - single text on privacy and the use of IT systems) and according to art. 12, 13 and 14 of EU Regulation 2016/679 - General Data Protection Regulation (GDPR). Data treatment and reporting took place in aggregate form.

3. Results

From August 2016 to April 2019, 1851 tourists participated in the project and successfully completed both questionnaires (T₀ and T₁), of which 55% were women and 45% were men; the most frequent age group was over 46-year-olds, followed by 31 to 45-year-olds and under 30-year-olds; 60% of participants had completed middle or high school, followed by college graduates; 62% were non-naturalists, while 38% were naturalists (Table 1).

3.1. Reliability analysis

Cronbach's alpha values for both the attitude and awareness variables exceeded a threshold of 0.6 (Table B1 in Appendix B), which is considered acceptable as evidence of a relationship (Branchini et al., 2015b; Goffredo et al., 2010). Accordingly, all items' scores of both variables were substituted by mean score values for both variables and

for each tourist at T_0 and T_1 .

3.2. Analysis among localities

PERMANOVA results showed a significant difference in attitude (Pseudo- $F = 4.482$, $P(\text{perm}) = 0.001$) and awareness (Pseudo- $F = 27.227$, $P = 0.001$) scores among localities, but no significant differences for knowledge scores (Pseudo- $F = 1.228$, $P = 0.303$). We then decided, in order to keep a consistency to the statistical analysis, to analyze all three sustainability variables in each locality separately.

3.3. Sustainability variable analysis

3.3.1. Knowledge

PERMANOVA results showed a significant increase in tourist knowledge scores from T_0 to T_1 ($P = 0.001$, Fig. 2, Table 3, Table C1 in Appendix C) at all localities. At Nosy Be, the factor education showed significant differences ($P = 0.03$, Table 3) at T_0 (Table C2 in Appendix C). At Dhiggi, significant interactions were found between the factors sex and education ($P = 0.038$, Table 3), the factor nature contact showed significant differences ($P = 0.042$, Table 3) at T_0 (Table C3 in Appendix C) and the factor age showed significant differences ($P = 0.003$, Table 3) at T_0 and T_1 (Table C3 in Appendix C). At Maayafushi, significant interactions were found between the factors sex and education ($P = 0.025$, Table 3) and the factor nature contact showed significant differences ($P = 0.008$, Table 1) at T_0 and T_1 (Table C5 in Appendix C). For details on these results, see Appendix C.

3.3.2. Attitude

PERMANOVA results showed a significant increase in tourists' attitude scores from T_0 to T_1 ($P = 0.001$, Fig. 2, Table 4, Table D1 in Appendix D) at all localities. At Nosy Be, significant interactions were found between the factors sex and nature contact ($P = 0.019$, Table 4) at T_0 and T_1 (Table D2 in Appendix D), and the factor age showed significant differences ($P = 0.003$, Table 4) at T_0 and at T_1 (Table D2 in Appendix D). At Dhiggi, significant interactions were found among the factors sex, age and nature contact ($P = 0.002$, Table 4) at T_0 (Table D4 in Appendix D). At Maayafushi, significant interactions were found among the factors age, education and nature contact ($P = 0.041$, Table 4) at T_0 and T_1 (Table D6 in Appendix D), and the factor sex showed significant differences ($P = 0.001$, Table 4) at T_0 and T_1 (Table D6 in Appendix D). For details on these results, see Appendix D.

3.3.3. Awareness

PERMANOVA results showed a significant increase in tourist awareness scores from T_0 to T_1 ($P = 0.001$, Fig. 2, Table 5, Table E1 in Appendix E) at all localities. At Nosy Be, significant interactions were found between the factors age and education ($P = 0.031$, Table 5) at T_0 and T_1 and the factor nature contact showed significant differences ($P = 0.011$, Table 5) at T_0 and T_1 (Table E2 in Appendix E). At Dhiggi, the factors age and sex showed significant differences ($P = 0.001$, Table 5) at T_0 and T_1 (Table E4 in Appendix E). At Maayafushi, significant interactions were found between the factors sex and education ($P = 0.039$, Table 5) at T_0 and at T_1 (Table E5 in Appendix E), and the factor age showed significant differences ($P = 0.001$, Table 5) at T_0 and T_1 (Table E5 in Appendix E). For details on these results see Appendix E.

3.3.4. Tourist satisfaction

Across all locations, 92–96% of tourists answered positively ("Agree" or "Strongly agree") to the project meeting their expectations (Appendix F); 94–95% felt their ideas were respected by the Glocal Education project group; 87–88% felt satisfied with having participated in the project's initiative; 64–74% would check for the presence of an environmental education project on their next vacation; 36–46% identified personally with the project; 74–79% considered themselves supporters of the Glocal Education project; 36–38% would choose to go on vacation

again with the tour operator that promoted the project in the next year; 61–64% would choose to go on vacation again with the tour operator that promoted the project in the next 3 years; 87–92% were happy to participate in the Glocal Education project; 43% felt that when someone speaks ill of the project, it is as if they did it to them; and 86–91% shared the ideas behind the project.

3.3.5. Customer loyalty

Across all locations, at T_0 , 41–67% of the tourists declared to be willing to pay up to 10% more than the standard price to stay in a facility owned by the tour operator promoting the project with a biologist on site who organizes activities in contact with nature (item 1; Table 6, Appendix G); 42–62% would not pay up to 5% more than the standard price to stay in a facility owned by the tour operator promoting the project, but without a biologist (item 2); 35–51% would pay up to 5% more than the standard extra price to stay in a structure of an unknown tour operator, but with the presence of a biologist on site (item 3); 31–58% would pay up to 3% more than the standard price to stay in a structure of an unknown tour operator that proposes an organized activity in contact with nature but does not have a biologist (item 4) and 40–70% would not pay the standard price for any tour operator, without biologist and without activities in contact with nature (item 5). At T_1 , the answers changed to 48–71% on item 1; 60–68% on item 2; 42–52% on item 3; 48–54% on item 4 and 67–71% on item 5. Furthermore, from T_0 to T_1 , the number of tourists that failed to answer any one of the items in the questionnaire changed from 1.4–36.2% to 2.1–3.6% on item 1, 3.3–38% to 3–5.2% on item 2, 2.2–36.8% to 2.3–4.8% on item 3, 2.7–38.5% to 3.2–5.7% on item 4, 3.3–38.9% to 3.2–5.9% on item 5.

4. Discussion

How people behave regarding a sustainable approach towards the environment hinges on the values underlying people's perspectives on nature and the goals of its sustainable development. In everyday usage, 'values' are portrayed through interests, pleasures or desires. These subjective dimensions are among others mutually formed by knowledge, attitudes and awareness associated with individuals and social and cultural groups (O'Brien and Wolf, 2010). In this regard, results of this study demonstrate that participating in an environmental education project increased all three sustainability variables analyzed: knowledge of biology and ecology concepts (knowledge), willingness to engage in environmentally friendly attitude (attitude) and awareness of tourism impact on natural ecosystems (awareness). This shows that informal environmental education activities can play an important role in promoting sustainable behavioral intentions on tourists on vacation, which is an important step to create interest and sensitivity towards the environment. The analysis conducted using the demographic factors showed that, overall, females presented higher scores than males on all three sustainability variables (knowledge, attitude and awareness), with the exception of Dhiggi at T_1 (after project activities), where male college graduates were found to have a higher knowledge score than females. This corroborates previous findings obtained on students in schools, where girls outperform boys, exhibiting higher knowledge, more positive attitude and more environmentally aware behavior in school (Olsson and Gericke, 2017). In general, the higher age classes presented higher scores on all three sustainability variables. This is in agreement with previous findings showing that elderly people tend to be more ecologically engaged compared to younger generations as a result of their firsthand experiences of environmental disasters (e.g., Chernobyl, the Exxon Valdez oil spills) (Otto and Kaiser, 2014). At all localities, college graduates showed higher scores than high school graduates on all three sustainability variables, except for Maayafushi, where adult high school graduate naturalists showed a higher attitude score than adult college graduate naturalists both before and after project activities. Several studies report the development of programs regarding

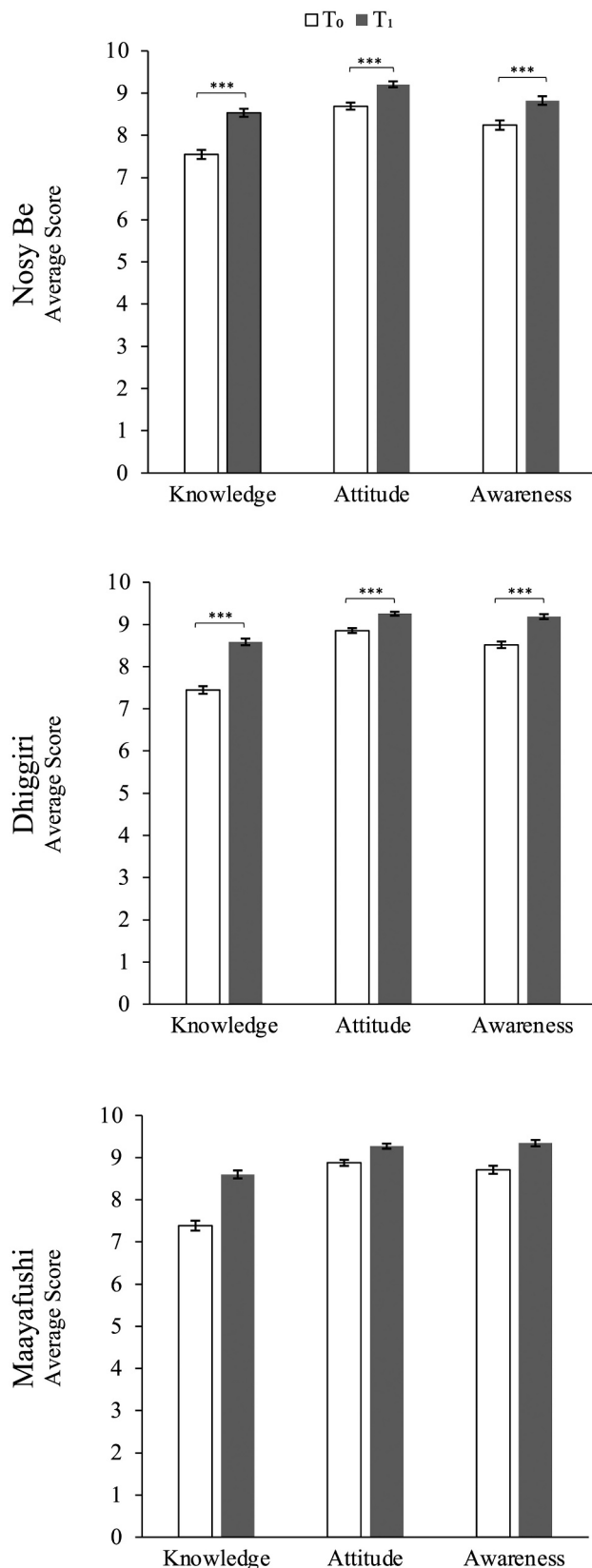


Fig. 2. Before and after scores. Permutational multivariate analysis of variance (PERMANOVA) results for comparisons of knowledge, attitude and awareness scores between T₀ and T₁ (before and after project activities). Error bars represent 95% CI. Significant effects are indicated with asterisks ($p \leq 0.001$).

sustainability issues and environmental learning for higher education institutions (de la Harpe and Thomas, 2009; Felgendreher and Löfgren, 2018; Shephard, 2010), which could help explain our findings. The aforementioned exception could be due to nature contact, rather than education level, which in turn relates to the overall result that naturalists show a higher score on the three sustainability variables (knowledge, attitude, awareness), in comparison to non-naturalists, at all three localities. Differences among factor significances among localities could be due to the fact that each touristic facility targets different demographics. Nosy Be (Madagascar) offers exotic scenarios with close contact with local flora and also targeted packages for teens, families and friends on vacation. Dhigiri (Maldives) offers relax for adults, as children under 12 are not allowed, with close contact with the local marine ecosystem and targeted packages for couples on honeymoon. Maayafushi (Maldives) encompasses both scenarios, with the proximity of the sea and entertainment that targets from children to elders, with targeted packages for kids and couples on honeymoon. These differences could explain the fact that tourists who choose to visit any of the facilities might have different inclinations and interests towards nature, attempting to actively explore the natural landscape or just enjoying the calm and relaxation such a secluded facility can provide. Overall, tourists showed a high level of satisfaction with project activities and customer loyalty answers reveal willingness to pay extra in order to enjoy touristic facilities with the presence of a biologist and environmental education activities. Moreover, the decrease in the percentage of tourists who chose not to answer the customer loyalty questions in the questionnaire T₀ as opposed to T₁ indicate that even though they were not willing to dispose of extra income in order to participate in environment-related activities before the project, they were much more inclined to do so once they became a part of Glocal Education project. This positive response of the customer could lead to positive sustainability outcomes (Sheth et al., 2011) as the tourist who identifies with the Glocal Education project tends to look for environmentally-related activities when going on vacation, generating a trend for tour operators which could result in bigger profits for the tourism industry. Furthermore, the promotion of environmental education projects in touristic destinations could lead to an initial shift towards the sustainable use of resources, involving thousands of people and increasing environmental awareness, so as to popularize the importance of conservation actions.

4.1. Implications for conservation

Our results corroborate the finding that when informal education activities are proposed in a stress-free environment, participants are more likely to take interest and even retain more information about concrete measures that can be taken in order to alleviate some of the pressure our daily activities put on natural ecosystems (Ballantyne et al., 2011; Branchini et al., 2015a; Meschini et al., 2021; Ballantyne and Packer, 2011). When people discover the consequences of their actions upon the environment, they are able not only to change their own attitude, but also to become advocates in enlightening other people to do the same (Gössling, 2018; Tisdell and Wilson, 2001). People who are made aware of the local and global scale of an environmental problem are found to be more likely to take action in mitigating said problem, supporting conservation efforts (through financial contribution to environmental organizations), as well as acting individually in favor of the environment (like reducing their own carbon footprint) (Rabinovich et al., 2009).

Environmental education projects such as Glocal Education can be developed by the tourism sector in a smaller or larger scale, acting as triggers for advocate behavior in tourists, using informal education activities to create a web of sustainability and action towards the conservation of the environment.

Table 3

Knowledge scores. Permutational multivariate analysis of variance (PERMANOVA) results for comparisons of knowledge scores by Time, sex, age, education (edu) and nature contact (nat), and their interactions. Tests were run using Euclidean distances among samples and 999 permutations in the software Primer. Significant effects ($P(\text{perm}) < 0.05$) are indicated in bold.

Source	Nosy Be			Dhiggiri			Maayafushi		
	df	Pseudo-F	P(perm)	df	Pseudo-F	P(perm)	df	Pseudo-F	P(perm)
Time	1	86.979	0.001	1	264.53	0.001	1	157.1	0.001
Sex	2	0.946	0.411	2	2.203	0.111	2	0.742	0.472
Age	4	1.420	0.231	4	4.472	0.003	4	1.339	0.235
Edu	2	3.549	0.030	2	12.289	0.001	2	5.242	0.010
Nat	2	2.562	0.081	2	3.248	0.042	2	5.760	0.008
Sex x age	4	0.222	0.919	4	0.607	0.650	4	0.667	0.614
Sex x edu	2	0.468	0.664	2	3.296	0.038	2	3.420	0.025
Sex x nat	2	0.209	0.819	2	0.598	0.540	2	1.042	0.354
Age x edu	4	0.585	0.657	4	0.536	0.729	4	1.825	0.111
Age x nat	4	0.992	0.389	4	1.111	0.365	4	0.376	0.810
Edu x nat	2	0.0313	0.962	2	1.018	0.364	2	0.942	0.392
Sex x age x edu	4	0.643	0.648	4	0.302	0.856	4	1.682	0.141
Sex x age x nat	4	1.908	0.105	4	0.943	0.444	4	0.653	0.616
Sex x edu x nat	2	1.486	0.233	2	0.525	0.566	2	1.759	0.166
Age x edu x nat	4	1.367	0.255	4	0.797	0.527	4	0.345	0.838
Sex x age x edu x nat	4	0.347	0.827	4	0.316	0.874	4	0.525	0.707
Residuals	836			1714			1006		
Total	883			1761			1053		

Table 4

Attitude scores. Permutational multivariate analysis of variance (PERMANOVA) results for comparisons of attitude scores by Time, sex, age, education (edu) and nature contact (nat), and their interactions. Tests were run using Euclidean distances among samples and 999 permutations in the software Primer. Significant effects ($P(\text{perm}) < 0.05$) are indicated in bold.

Source	Nosy Be			Dhiggiri			Maayafushi		
	df	Pseudo-F	P(perm)	df	Pseudo-F	P(perm)	df	Pseudo-F	P(perm)
Time	1	41.868	0.001	1	96.206	0.001	1	52.307	0.001
Sex	2	2.582	0.060	2	17.444	0.001	2	13.546	0.001
Age	4	4.550	0.003	4	15.532	0.001	4	10.629	0.001
Edu	2	1.106	0.319	2	0.145	0.868	2	2.367	0.106
Nat	2	5.545	0.004	2	6.256	0.004	2	3.610	0.032
Sex x age	4	0.617	0.662	4	2.083	0.089	4	0.511	0.739
Sex x edu	2	1.904	0.153	2	0.783	0.473	2	0.572	0.576
Sex x nat	2	3.882	0.019	2	1.987	0.131	2	0.406	0.692
Age x edu	4	1.211	0.300	4	2.243	0.066	4	5.040	0.001
Age x nat	4	0.457	0.782	4	1.143	0.317	4	0.719	0.556
Edu x nat	2	1.223	0.299	2	0.400	0.700	2	0.012	0.99
Sex x age x edu	4	0.831	0.489	4	0.732	0.572	4	1.035	0.371
Sex x age x nat	4	0.800	0.541	4	4.251	0.002	4	0.799	0.519
Sex x edu x nat	2	0.262	0.770	2	0.240	0.797	2	0.231	0.776
Age x edu x nat	4	1.982	0.092	4	0.653	0.615	4	2.612	0.041
Sex x age x edu x nat	4	1.848	0.128	4	0.587	0.658	4	0.823	0.536
Residuals	836			1714			1006		
Total	883			1761			1053		

4.2. Study limitations

Potential limitations of this study lie in the fact that we assessed changes over the period of one week, which did not account for how such increments in all sustainability variables translate to permanent changes in the population, promoting environmentally friendly actions triggered by the same tourists who participated in the project. The next step of this study is to resurvey tourists after one year of participation in the project, to evaluate possible long-term outcomes.

5. Conclusion

Investigating variables such as knowledge, attitude, and awareness could have extensive implications for environmental conservation, described as the management of environmental resources (Budowski, 1976), as peoples' actions have the power to affect biodiversity and sustainability in a positive or negative manner (Newhouse, 1990). Even though demographical factors showed some influence in our results, we conclude that overall, informal environmental education experiences as

those provided by the Glocal Education project may increase environmental sensitivity and ultimately promote correct environmental behavior.

Nowadays the word ecotourism is often misused for self-promotion. However, the Glocal Education activities could be a first step towards a trend in environment awareness, providing tourists with the tools and knowledge to critically discern what is and isn't environmentally friendly, not only in terms of products and services, but also when choosing their vacation spots. Correctly educating tourists to what "sustainability" really means could lead tourists to choose tour operators promoting environmentally friendly resorts, ultimately enhancing their economic gain (Fig. 3).

Glocal Education could be an appealing attraction to be added to the plethora of activities that tourists are offered by tour operators while on vacation, as tourists could become more satisfied with the vacation experience. This would provide a "win-win" situation for tourists, tour operators and also - albeit in a smaller proportion and in a longer time-frame - biodiversity conservation. The Glocal Education project could become a best practice for tour operators worldwide, generating not

Table 5

Awareness scores. Permutational multivariate analysis of variance (PERMANOVA) results for comparisons of awareness scores by Time, sex, age, education (edu) and nature contact (nat), and their interactions. Tests were run using Euclidean distances among samples and 999 permutations in the software Primer. Significant effects ($P(\text{perm}) < 0.05$) are indicated in bold.

Source	Nosy Be			Dhiggiri			Maayafushi		
	df	Pseudo-F	P(perm)	df	Pseudo-F	P(perm)	df	Pseudo-F	P(perm)
Time	1	31.618	0.001	1	169.520	0.001	1	66.893	0.001
Sex	2	0.463	0.611	2	24.401	0.001	2	16.967	0.001
Age	4	2.529	0.038	4	13.339	0.001	4	8.542	0.001
Edu	2	6.776	0.005	2	0.336	0.736	2	0.755	0.481
Nat	2	5.008	0.011	2	0.846	0.423	2	0.654	0.525
Sex x age	4	0.166	0.955	4	1.474	0.188	4	1.124	0.315
Sex x edu	2	0.085	0.921	2	0.016	0.984	2	3.273	0.039
Sex x nat	2	0.678	0.499	2	0.344	0.712	2	0.692	0.492
Age x edu	4	2.632	0.031	4	0.174	0.958	4	0.080	0.991
Age x nat	4	1.904	0.104	4	1.143	0.358	4	2.217	0.075
Edu x nat	2	1.109	0.328	2	0.986	0.376	2	0.252	0.772
Sex x age x edu	4	0.872	0.462	4	0.593	0.682	4	0.372	0.832
Sex x age x nat	4	0.785	0.516	4	0.648	0.644	4	0.905	0.448
Sex x edu x nat	2	0.145	0.867	2	0.338	0.732	2	1.452	0.239
Age x edu x nat	4	0.777	0.512	4	0.589	0.683	4	1.107	0.341
Sex x age x edu x nat	4	0.441	0.769	4	0.132	0.968	4	1.552	0.183
Residuals	836			1714			1006		
Total	883			1761			1053		

Table 6

Customer loyalty values. Customer loyalty answers for questionnaires T₀ and T₁ at all three localities.

		Item									
		1 ^a		2 ^b		3 ^c		4 ^d		5 ^e	
		T0	T1	T0	T1	T0	T1	T0	T1	T0	T1
Nosy-Be	% no answer ^f	4.3	3.6	5.9	5.2	5.9	4.8	6.8	5.7	6.8	5.9
	% negative answer ^g	11.8	12.7	9.0	11.5	22.6	19.5	18.1	15.8	4.5	4.1
	% neutral answer ^h	16.5	13.1	23.3	23.3	24.0	23.3	26.9	27.6	21.3	20.6
	% positive answer ⁱ	67.4	70.6	61.8	60.0	47.5	52.5	48.2	50.9	67.4	69.5
Dhiggiri	% no answer ^f	1.4	2.3	3.3	3.2	2.2	2.3	2.7	3.2	3.3	3.2
	% negative answer ^g	14.1	15.9	9.1	10.2	21.9	23.1	18.8	13.7	5.4	3.7
	% neutral answer ^h	19.4	22.9	20.9	21.5	25.1	30.7	26.4	29.5	21.4	22.1
	% positive answer ⁱ	65.2	59.0	66.8	65.1	50.9	43.9	52.0	53.6	69.8	71.0
Maayafushi	% no answer ^f	36.2	2.1	38.0	3.0	36.8	3.4	38.5	3.2	38.9	3.6
	% negative answer ^g	10.4	23.1	7.8	9.1	12.3	21.6	14.6	18.6	4.6	3.8
	% neutral answer ^h	12.3	26.6	12.0	20.3	16.1	33.0	15.9	30.2	16.9	25.8
	% positive answer ⁱ	41.0	48.2	42.3	67.6	34.7	41.9	30.9	48.0	39.7	66.8

^a Customer willing to pay up to 10% more than the standard price to stay in a Francorosso facility with nature-related activities and a biologist on site;

^b Customer willing to pay up to 5% more than the standard price to stay in a Francorosso facility, without a biologist;

^c Customer willing to pay up to 5% more than the standard price to stay in another tour operator facility with a biologist on site;

^d Customer willing to pay up to 3% more than the standard price to stay in another tour operator facility with nature-related activities but no biologist on site;

^e Customer willing to pay standard price for any tour operator, with neither nature-related activities nor a biologist on site.

^f Percentage of tourists who didn't answer each of the items at both times.

^g Percentage of tourists who answered "disagree" or "strongly disagree" to each of the items at both times.

^h Percentage of tourists who answered "neutral" to each of the items at both times.

ⁱ Percentage of tourists who answered "agree" or "strongly agree" to each of the items at both times.

only further environmental awareness within tourists, but also higher profits for the entrepreneurs that host the project. Furthermore, such activities could possibly be extended to other informal contexts beyond the touristic environment (e.g., museums, zoos, parks). In order to assess how this environmental knowledge, attitude and awareness can translate into actual behavioral change, further (follow-up after at least one year) studies are required, by including also psychological variables to assess how personal response to the project might influence long-term retention of the studied variables (knowledge, attitude and awareness).

Appendixes A-G. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.biocon.2021.109122>.

CRediT authorship contribution statement

Marta Meschini: Data curation, Writing - Review & Editing. **Mariana Machado Toffolo:** Investigation, Data curation, Writing - Original Draft, Writing - Review & Editing, Visualization. **Erik Caroselli:** Writing - Review & Editing, Visualization. **Silvia Franzellitti:** Writing - Review & Editing, Visualization. **Chiara Marchini:** Funding acquisition, project administration, Writing - Review & Editing, Visualization. **Fiorella Prada:** Writing - Review & Editing, Visualization. **Alessio Boattini:** Formal Analysis. **Viviana Brambilla:** Methodology. **Grit Martinez:** Writing - Review & Editing. **Francesca Prati:** Methodology. **Ginevra Simoncini:** Investigation. **Marco Visentin:** Writing - Review & Editing. **Valentina Airi:** Methodology. **Simone Branchini:** Methodology. **Stefano Goffredo:** Conceptualization, Supervision, Funding acquisition.

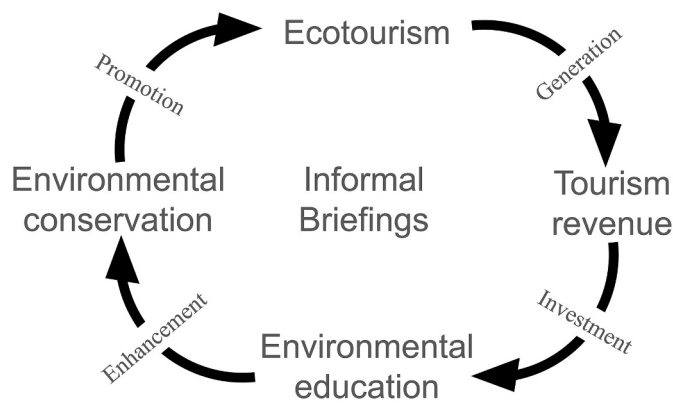


Fig. 3. Schematic diagram of Glocal Education's contribution to tourism sustainability. The diagram illustrates how environmental education informal briefings can have meaningful implications for environmental conservation, while helping advertise ecotourism, bringing revenue to the tourism industry, who ultimately can reinvest in environmental education projects, creating a network of sustainability that bolsters environment conservation and economic growth (based on Ramadoss and Moli, 2010).

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