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Exposure Visits and Biodiversity Conservation: Can Field Visits affect the Conservation Cognizance?

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***Abstract*:** The study attempted to assess the change in students' cognizance towards biodiversity and conservation due to exposure visits. About 163 students, who visited the Institute of Forest Biodiversity (ICFRE-IFB), Hyderabad, during February and March 2023 for an exposure visit, form the respondent group. The survey schedule consisted of two components: i) a structured survey-where students were asked to respond to pre-defined questions, and ii) students were requested to do annotated drawings before and after the visit. Survey responses were subjected to statistical tests and correspondence analysis. Pre- and post-visit drawings were analyzed based on i) change in the number of components, and ii) improvement in clarity on biodiversity conservation. The students who thought biodiversity conservation was unessential before the visit have changed their perception and understood its importance. Besides, students who earlier were unconcerned about conservation, in the post-visit mentioned that they are personally concerned about biodiversity conservation. Moreover, students revealed a high level of learning and enjoyment through the visit. Correspondence analysis revealed that learning is highly associated with the level of enjoyment. Analyzing the annotated drawings indicated that there is an increase in the number of components by 1.3 units, and an improvement in the clarity about biodiversity conservation.

***Keywords*:** Biodiversity, Conservation, Annotated drawings, Correspondence analysis

India is one of the megadiversity countries in the world, hosting approximately 12% of the species recorded globally (Dar et al., 2022). Among the species reported from India, nearly 47% of reptiles and 61.2% of amphibians are predominantly endemic to the country (Deuti et al., 2022). The 10 biogeographical zones accommodate 45,500 plant species and 91,200 animal species (CBD 2023). The reported list of species is not yet saturated; in 2022 alone, 467 new animal species (Banerjee et al., 2023) and 339 new plant species (BSI 2023) were discovered, indicating the rich biodiversity status of India. However, increasing population, industrial development, and rapid urbanization have challenged the sustenance of biodiversity over the past decades by placing pressure on natural resources (Semy and Singh 2021). These anthropogenic disturbances have adversely affected biodiversity status, which, if left unchecked, may threaten the existence of humankind in the long run. Recognizing the importance of biodiversity, the Government of India has launched various conservation programmes like National Afforestation Programme (2000), National Biodiversity Action Plan (2009), National Plan for conservation of Aquatic Ecosystems, Recovery of Endangered species and Green India Mission (2014), *etc*. However, to scale up these initiatives and ensure their successful implementation, public participation is an essential component. To ensure public participation, the public need to be sensitized regarding the importance of biodiversity and its conservation (Barman et al., 2021). For this diffusion process, school students can be primarily targeted through education, as they not only form the future workforce but may also function as an excellent diffusion network to reach out to other age groups. Education in the form of capacity building, empowerment, and public engagement has been identified as an effective tool for the successful and sustainable implementation of actions. Education should take the form of transformative learning that can infuse critical and holistic thinking to foster behavioural change (Singh and Rahman 2012). To sensitize students, integrating well-planned compulsory education on biodiversity into curricula from the early age of 11 can help them gain knowledge and understanding related to the importance of biodiversity conservation while developing a sense of responsibility to protect it (Gayford 2010, De and Dwivedi 2023).

Though environmental science courses are included in the curriculum of Indian schools, there is a debate about whether such nature-related subjects should also consider field teachings along with the theoretical part, as the former ensures learning through field experience. To provide evidence that field-based experience improves students' learning, we formulated this study to evaluate the change in students' perceptions and awareness about biodiversity and

its conservation after a field visit to the ICFRE-Institute of Forest Biodiversity (IFB), Hyderabad, a research institute focused on biodiversity and related aspects. The major research questions addressed in the study are (i) Does a field visit help improve students' awareness related to biodiversity? (ii) Does a field visit help improve students' attitude towards biodiversity conservation? The study aimed to gather evidence via mixed-method approaches, and the insights may help policymakers design better curricula to optimize the students' learning curve.

MATERIAL AND METHODS

Present study was conducted at ICFRE-IFB, Hyderabad having an area of 40 ha in the backdrop of tropical dry deciduous forest, Dulapally reserve forest, enriched with diversified flora and fauna. The institute established field gene banks or field trials of threatened tree species such as Indian sandalwood, Red sanders and Indian rosewood and other species such as bamboos, mahua and teak. Nearly 50% of the institute's area has undisturbed natural forest patch which houses over 144 plant species, belonging to 55 plant families that includes 71 tree species, 50 species of birds including dove, peacock, quail, owl, *etc*., reptiles such as chameleon, garden lizard, snake, monitor lizard, etc., mammals such as bats, mongoose, rat, wild boar, wild cat, porcupine, squirrel, etc., and several insect species (Prasad et al., 2018). As part of the institute's extension mechanism, school students visit the institute for a field visit and interact with scientists of different disciplines. Hence, the present study was conducted to understand the effect of such an exposure visit on altering the attitude and cognizance of students towards biodiversity and its conservation.

Treatment: During the institute visit, the students were exposed to insect collection, seed collection and nurseries comprising rare and endangered plant species to give insights on the *ex-situ* biodiversity conservation. Later, the students were taken to the forest patch of the campus where they had the chance to observe various flora and fauna.

Data collection: For this study, a pre- and post-visit survey was conducted among 163 students who visited ICFRE-IFB, Hyderabad during February and March 2023. These included all students from both government and private schools who visited the institute during the period. The students were asked to make annotated drawings about biodiversity before and after the visit (Jensen 2014). In addition, students were requested to respond to pre-defined questions and the responses were measured using Likert scale to probe their perception and attitude towards conservation.

Data analysis: The pre- and post-visit drawings were evaluated based on two aspects: (i) change in number of components and (ii) change in clarity in mentioning the biodiversity components. Evaluation of pre and post-visit drawings were done independently by four researchers, and a consensus was reached after verification. For qualitative analysis, tabular and descriptive statistics were used at relevant places. Apart from this, a t-test was used to find differences among the pre- and post-visit data, and correspondence analysis was used to visualize the association between the level of enjoyment and the level of learning (Greenacre 2010, Mohankumar et al., 2023).

RESULTS AND DISCUSSION

The study comprised 163 students from six different schools, including 106 boys and 57 girls, with an average age of 14 years. Analysis of the response to the question about students' perception of the need for biodiversity conservation, the results revealed that 7 students who had thought that it was nonessential to conserve biodiversity earlier or who were unsure of biodiversity conservation had begun to understand and acknowledge the need for biodiversity conservation (Table 1). Similarly, 31 students who were unsure or not personally concerned about biodiversity conservation prior to the survey were personally concerned after their visit (Table 2).

Primarily, students' visits have positively impacted their understanding of biodiversity conservation. Studies have shown that personal visits influence the emotions of the visitors and increase their biophilia (Myers et al., 2004), and biophilia catalyses a positive conservation attitude towards a particular animal or plant among the students (Stokes 2007, Ballouard et al., 2012).

Table 1. Students' response to the question “Is there a need to conserve biodiversity? What do you think?”

Response	Pre-visit (n)	Post-visit (n)	Change (n)
Yes	152	159	+7
No	3	1	-2
Not sure	8	3	-5
Total	163	163	–

Table 2. Students' response to the question, “Are you personally concerned about conserving biodiversity?”

Response	Pre-visit (n)	Post-visit (n)	Change (n)
Yes	102	133	+31
No	16	12	-4
Not Sure	45	18	-27
Total	163	163	–

When students were asked to self-report their level of learning and enjoyment during the visit, the majority indicated the highest levels of both learning and enjoyment (Table 3). Similar results were also reported by Lavie Alon and Tal (2015) and Whitburn et al., (2023). To explore the potential link between learning and enjoyment levels, we used a correspondence analysis biplot, which showed a positive relationship between these levels (Fig. 1). Therefore, students were able to learn more joyfully during visits than in regular classroom setting. Several studies have also confirmed that emotional bonds with nature, especially at early ages, can significantly influence conservation behaviour (Cheng and Monroe 2012, Collado and Corraliza 2015). Hence, visits could be crucial in changing conservation behaviour among students. Hughes et al. (2011) also analysed the post-visit actions of Australian families and reported that the group involved demonstrated improvements in conservation knowledge, attitudes towards wildlife, and litter-picking frequency.

With the help of four researchers, the pre-visit and post-visit drawings were evaluated based on the number of components. To know the difference in the number of components between pre- and post-visit, a paired t-test was used. The result indicated that, on average, the visit had increased the number of components by 1.3 units (Table 4). Besides, we also evaluated the change in clarity of biodiversity among the students due to the exposure visit. The experts observed the pre- and post-visit drawings and classified them into three categories- positive change, no change and negative change. The post-visit drawings of 65% of students had an improvement in clarity as compared to pre-visit drawings (Table 5) (Fig. 2).

Table 4. Change in the number of biodiversity components in the pre- and post-visit drawings

Variable	Mean	Std. Err.	Std. Dev.
Number of components in the pre-visit drawings	3.59	0.18	2.26
Number of components in the post-visit drawings	4.92	0.19	2.40
Mean difference	-1.33***	0.15	1.93

*** Significant at 1 percent LoS

Table 5. Change in the clarity of biodiversity components in the pre- and post-visit drawings

Change in clarity	Frequency	Percentage
Negative change	9	5.52
No change	48	29.45
Positive change	106	65.03

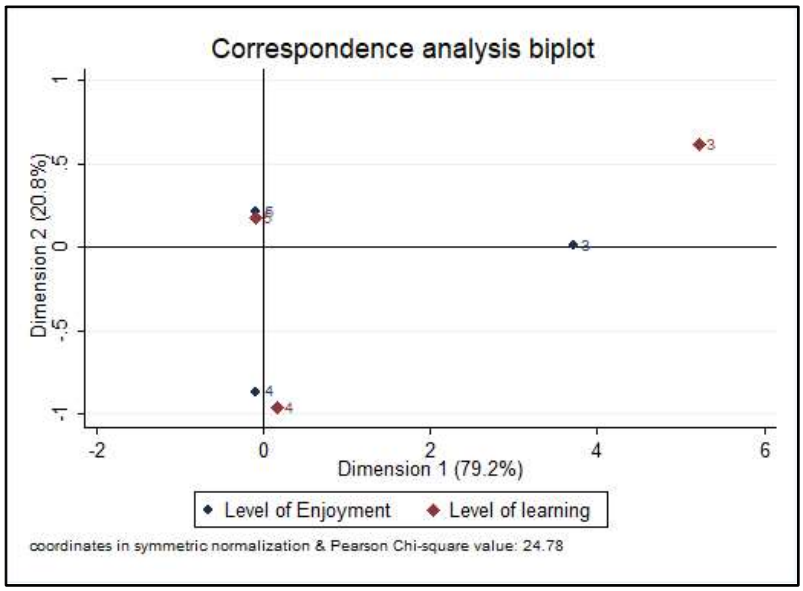

Fig. 1. Association between level of enjoyment and learning

Table 3. Level of learning and enjoyment

Attributes	Very low	Low	Moderate	High	Very high	Total
Rate your learning experience during your visit to the Institute of Forest Biodiversity, Hyderabad	0	0	2	26	135	163
Did you enjoy your visit to the Institute of Forest Biodiversity, Hyderabad?	0	0	4	31	128	163

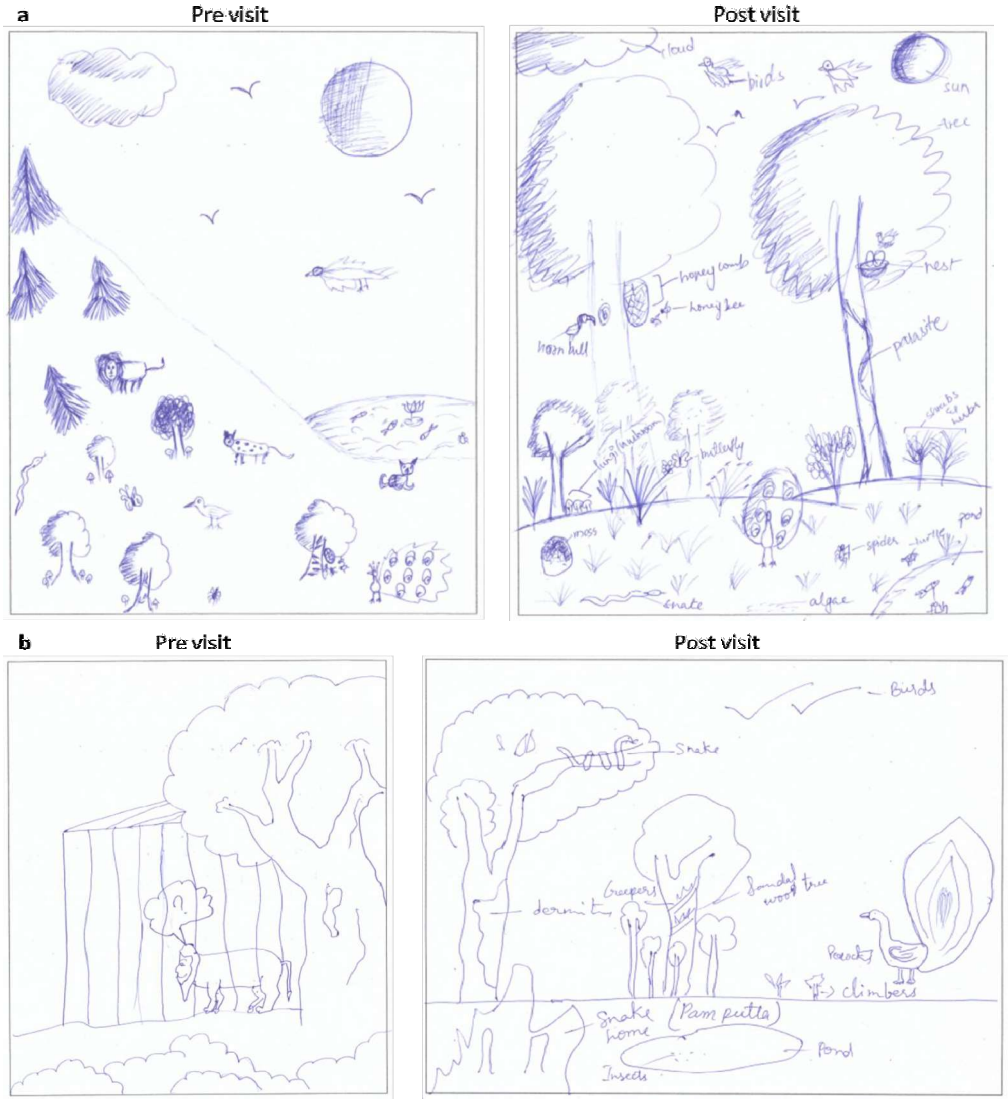

Fig. 2. Pre- and post-visit annotated drawings of (a) a 15-year-old girl and (b) a 14-year-old boy in response to the question to draw and label the components of biodiversity

Hence, engaging with nature at an early age could positively influence student's conservation behaviour. So, summer camps, treks, visits to natural parks, and zoological parks should be promoted and incorporated into student's curricula. Such guided visits with subject and field experts can play a potential role in educating even complicated issues related to biodiversity conservation (Whitehouse-Tedd et al., 2022) and sustainability (Counsell et al., 2023). Rather than using traditional teaching techniques, providing interactive multi-media screens, simulations, and visual effects would increase the probability of student's understanding of biodiversity (Lindemann-Matthies and Kamer 2006).

CONCLUSION

Analysis of pre- and post-visit annotated drawings clearly indicated the increased cognizance of students regarding biodiversity and conservation. Similarly, the analysis of structured survey data indicated the positive change in students' attitude towards biodiversity and its conservation. These results reiterate the need for guided exposure visits by students to biodiversity research, conservation, or related places at an early age to witness a positive change in students' attitude and perception towards biodiversity and its conservation. Apart from this, students may also act as efficient agents in diffusing the importance of biodiversity and its conservation among their networks, particularly parents

and elders. Hence, exposure visits could act as a magnificent tool to witness a positive change in the society.

AUTHOR'S CONTRIBUTION

Venkidusamy Kavi Sidharthan, Bharati Patel, Niranjan Sivalingam, Logesh Mohankumar, and Muthuprasad Thiyaharajan contributed equally to the conception, design, analysis, and manuscript preparation. Yuvaraj Praveen contributed to data collection and assisted in the review and editing of the manuscript.

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