



Effectiveness of conservation education program to enhance turtle conservation awareness in schoolchildren: A case of a local school in Chitwan, Nepal

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Abstract

Freshwater turtles and tortoises are among the most threatened groups of vertebrates globally, particularly due to anthropogenic pressure. This highlights the need to build stewardship among the stakeholders. In Nepal, many awareness programs have been organized in different areas, but information on their effectiveness is very limited. This study aimed to evaluate the effectiveness of a turtle-conservation education program in improving knowledge and awareness among the students. The program was implemented in a local school in Sauraha, Chitwan, and involved 66 lower-secondary students. Educational content was delivered through oral presentation, quiz competition, and poster presentation. Program effectiveness was evaluated using the pre- and post-questionnaire survey. The data were entered in MS-Excel and analyzed in JASP and R software, using paired sample t-test, independent sample t-test, and chi-square tests. The mean knowledge score in the pre-test was $36.2 \pm 13.3\%$ which increased to $58.3 \pm 18.2\%$ in the post-test. There was a significant shift in score categories between the two assessments. Changes in scores were independent of gender and grade level. These findings demonstrate that targeted conservation education can effectively enhance awareness and knowledge. Tailored educational programs can play an important role in conserving less charismatic species like turtles, which remain vulnerable even in protected areas.

Keywords: Chitwan, conservation education, school program, turtle

Introduction

Turtles belong to Order Testudines of reptiles and fossil history reveal the existence of turtle species for 230 million years (Rhodin et al., 2021). Freshwater turtles and tortoises are represented by 357 species and 478 taxa including the ten taxa that are extinct (Rhodin et al., 2021). In Nepal there are 17 species and 19 sub-species of turtles (Rai et al., 2022; Praschag et al., 2022), and Chitwan hosts nine of these species (Pun et al., 2023). Turtles play an important role in supporting both natural ecosystems and human well-being. They act as indicators of water quality, help purify water through scavenging, assist in seed dispersal, control insect and snail populations, and connect different levels of the food chain (Khan et al., 2021; Saeed et al., 2011). Despite these significances, they are yet to get the conservation attention they deserve, highlighted by the fact that turtles are the most threatened group among vertebrates (Stanford et al., 2020). Turtles are experiencing tremendous pressure through anthropogenic exploitation and habitat loss (Saeed et al., 2011). They are exploited for their meat, traditional medicine and as pets (Safi et al., 2021). As the majority of threats are human-induced, effective conservation education is vital to drive behavioral change and improve the conservation status of turtles. Environmental education integrates relevant environmental topics into the education system to raise awareness at all levels and to build environmentally

conscious citizens (Frame et al., 2021). Educated individuals with positive attitudes can play a significant role in shaping societal perceptions toward the conservation of wildlife. By involving communities in conservation efforts, attitudes can shift positively, leading to a better understanding of the importance of wildlife conservation. Although changing deeply-rooted beliefs take time, engaging children as future stewards of conservation can promote long-term change. To achieve the intended purpose of environmental education, students must be involved in conservation activities, and the curriculum must be effectively implemented (Adhikari et al., 2017). It is essential to adopt practical teaching methods that can highlight the importance of conservation and develop the passion needed to engage communities in conservation efforts (Frame et al., 2021).

The modern form of conservation in Nepal was initiated in the 1970s with the promulgation of National Park and Wildlife Conservation Act and the establishment of Chitwan National Park (Bhattarai et al., 2017). With the introduction of the Buffer Zone Management Regulation in 1996, the paradigm of conservation shifted from the fine and fence approach to participatory conservation (Spiteri & Nepal, 2008). In the buffer zone, the community receives 30-50% of the revenue generated by the protected area which is spent across diverse sectors, including conservation education

(DNPWC, 1999). However, even within the buffer zone of Chitwan National Park, less charismatic species like turtles are vulnerable to human exploitation and educational programs targeting such species are almost non-existent (Aryal & Paudel, 2024).

Hence, this study aimed to assess the effectiveness of a conservation education program to improve the knowledge of school students. For this purpose, we developed a tailored program for students and examined the factors that influence their learning outcomes.

Materials and Methods

Study Area

Ratnanagar is a municipality in Chitwan District. It is located in the central Terai region of Nepal at an elevation of about 200 meters. Chitwan is home to various native turtle species. The study was conducted at Shree Malpur Secondary School in Sauraha (Fig. 1). This school lies in the buffer zone of Chitwan National Park (27.584043°N, 84.494811°E). The buffer zone is important for wildlife conservation and habitat protection.

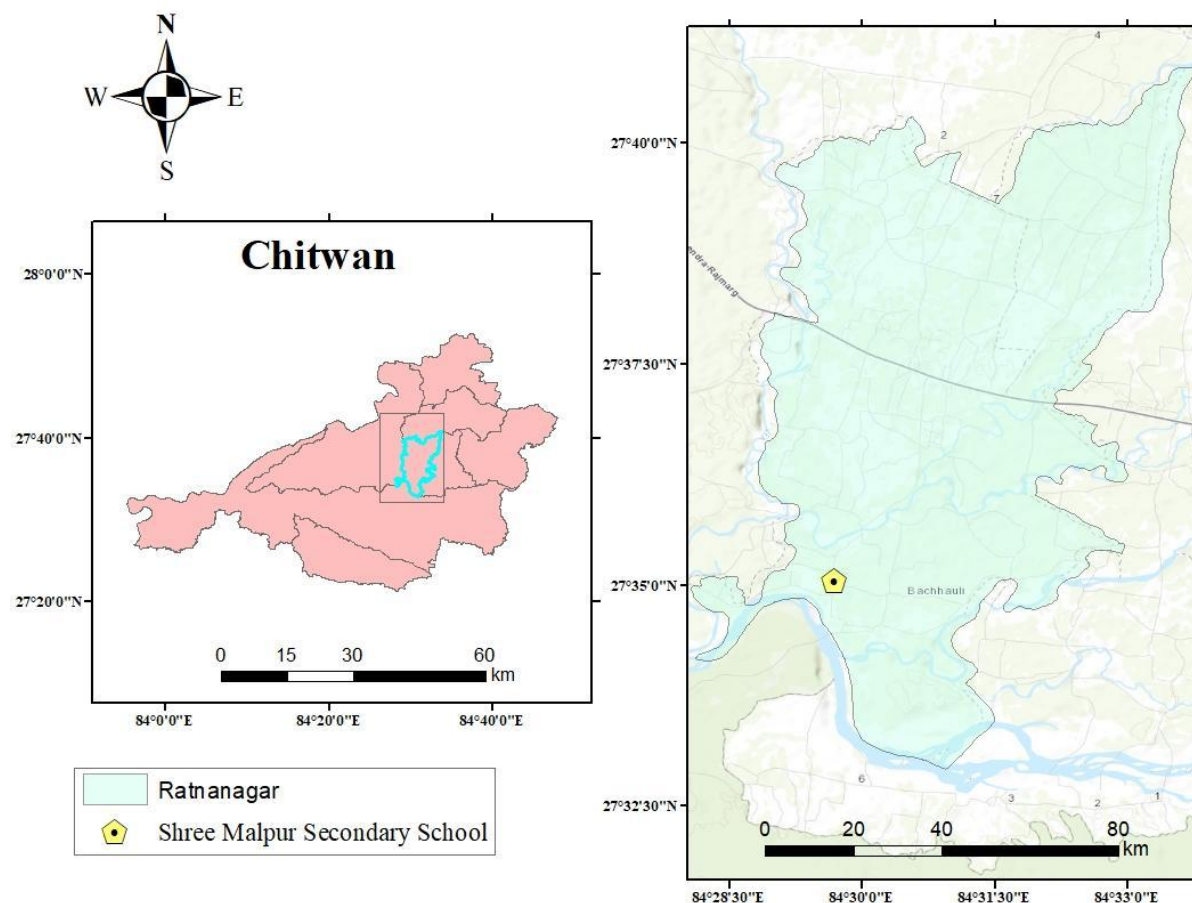


Figure 1 Study area map: Ratnanagar Municipality, Chitwan with location of Shree Malpur Secondary School

Methods

Conceptual framework

Effectively addressing a heterogeneous audience requires the utilization of diversified content delivery approaches to ensure that all participants understand the core concepts (Goyibova et al., 2025). This approach can help foster understanding among individuals who might otherwise remain uninterested or not get involved. When learning activities are designed with elements such as quizzes, competitions and rewards, they usually grab more attention, encourage active participation, and increase engagement (Wittayakom, 2025). Such approaches are expected to increase knowledge of turtle ecology, distribution, and conservation, leading to

improved learning outcomes which can be seen in higher post-test scores compared to pre-test results (Fig. 2).

Activities in field

Prior to the field activities, a presentation was prepared to highlight the distribution of freshwater turtles and tortoises in Nepal, threats faced by them, and their global conservation status. Information on turtles known to occur in the vicinity of Chitwan National Park, based on published literature (Pun et al., 2023), was also included. Additionally, we created a poster using chart paper and printed photographs, providing details about the conservation status of all seventeen turtle species found in Nepal. A structured questionnaire with ten questions related to the number of turtle species known in Nepal

and the Chitwan area, their conservation status, and the threats they face was developed for a pre-assessment, with the same set of questions used for the post-assessment. As a formative assessment tool, we designed

quiz questions to be administered at various points during the presentation. A video about turtle conservation in Nepal was also downloaded for display during the program.

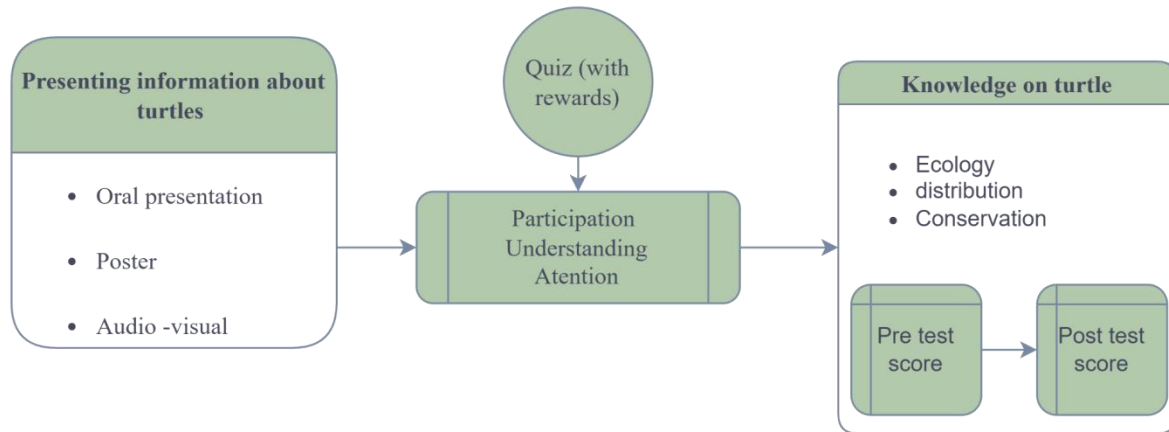


Figure 2 Conceptual framework of environmental education

We coordinated with the school principal via phone calls and a formal written letter, receiving verbal permission to conduct the session. Upon arrival at the project site, the school administration helped to gather students from class six and seven in a single hall. A total of 66 students participated, including 33 males and 33 females. The session began with a brief self-introduction and an explanation of the program's objectives. A pre-assessment was then conducted using the structured questionnaire, for which students were given 15 minutes to respond. This was followed by a 30-minute PowerPoint presentation delivered in Nepali language to ensure that all students could easily understand the content. An additional 15 minutes were allocated for poster presentation, during which students were shown images of various turtle species found in Nepal. A short educational video was also screened to enhance student's understanding. The educational session ended with an interactive question and answer round, during which students were encouraged to actively participate through small rewards. At the end of the program, the students' knowledge was assessed using the structured questionnaire designed for the post-test. To facilitate comparison, we asked the students to write their names, class (grade), and gender.

Data analysis

Answer sheets of pre-assessment and post-assessment were first evaluated using a pre-prepared answer key. The answer sheets from both assessments were arranged in alphabetical order and the score and other details were entered in the excel sheet. The data collected from the survey was analyzed by using MS-Excel and JASP software (JASP Team, 2024) and R software (R Core Team, 2024) in R Studio (RStudio Team, 2022). All the figures were prepared by using the ggplot2 package (Wickham, 2016). The difference in mean score of the students in pre and post assessment was evaluated by

using statistical approaches. For the quantitative values, the means were compared by using independent sample t-test while the categorical variables were assessed by using chi-square test. The scores were categorized into five different categories using the previously applied approach (Ismail et al., 2021) with some modifications (Table 1).

Table 1 Showing the score categorized in five respective grades

Score (%)	Grade
80 and above	A
60-80	B
40-60	C
20-40	D
0-20	E

Adopted from Ismail et al. (2021) with slight modification

Results and Discussion

General characteristics of participants

Altogether 66 students studying in grade 6 and 7 participated in the program (Table 2). Male and female students were equally represented. Participation from class 7 was marginally higher, with 35 students, as compared to 31 from class 6. Students aged between 10 to 16 years took part in the program and the average age of the students was 12.6 years.

Effectiveness of educational program

In pre-test, the students scored in the range of 20 to 70% (mean = 36.2) while in the post-test they scored in the range of 30 to 100% (mean = 58.3) (Fig. 3). The score of the students improved significantly by 22.1% (CI at 95% = 17.9 - 26.3) between two assessments (t = 10.429, df = 65, p < 0.05). As the post-test was carried out immediately after the completion of the knowledge sharing activities, the improvement was obvious.

Table 2 General Characteristics of the participants

SN	Characteristics			
1	Gender	Male	Female	
		50%	50%	
2	Class (Grade)	Six	Seven	
		31 (46.9%)	35 (53.1%)	
3	Age	Range	Mean	Standard deviation
		10- 16	12.6	1.4

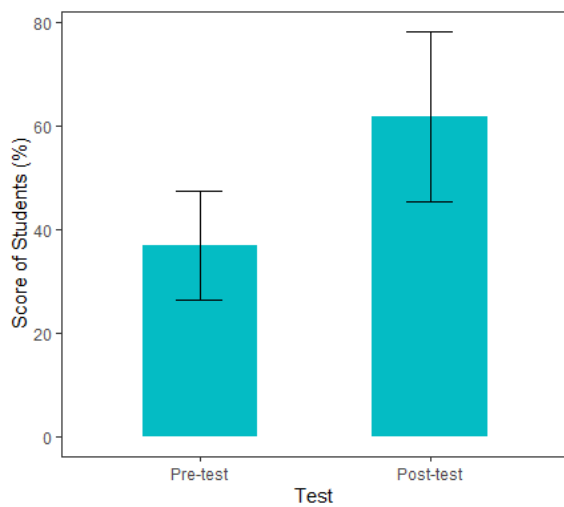


Figure 3 Score of the students in pre- and post-assessment. The bar represents the mean score, and the error bar represents the confident interval

In the group, female students improved their score by 24.8% and male students improved the score by 19.4% (Fig. 4a) however the difference was not statistically significant. Although different studies (Mutalib et al., 2013, Dietz et al., 1998) showed a significant difference in the score of male and female, our study supported the findings of Liefländer & Bogner (2014) and Caro et al. (2003), which suggests that the effectiveness of educational program is not influenced by the gender of the students. The findings of our study showed that the conservation education program was equally effective for both the genders since there was no significant difference between the mean change in score of males and mean change in score of females. This might be due to the fact that the program was executed by incorporating both male and female participants within the same hall.

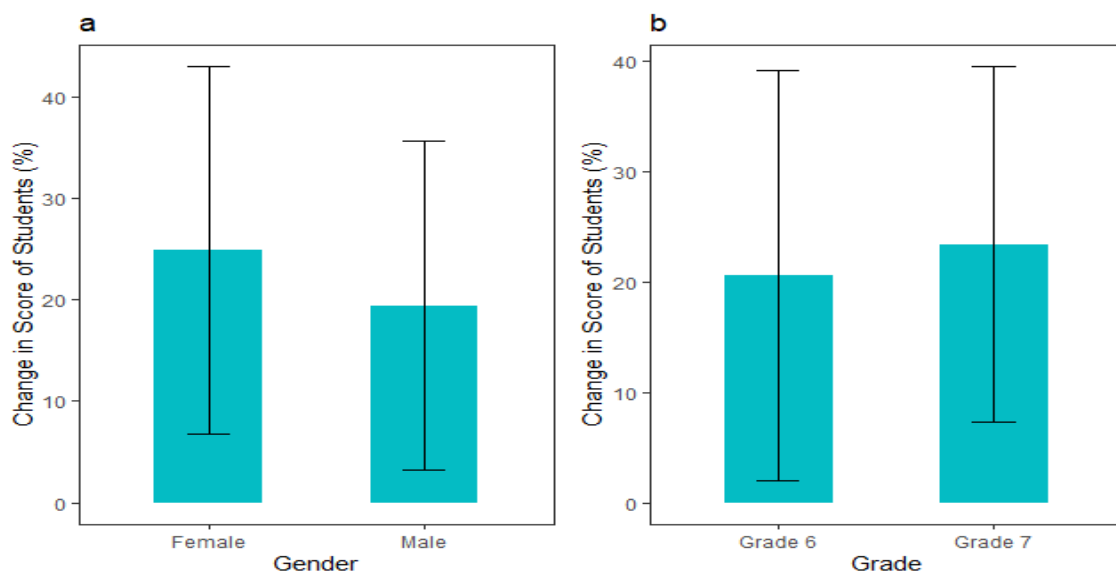


Figure 4 The change in the score of the students with respect to (a) Gender of the respondents and (b) grade of the students (here grade represents the class in which students are enrolled)

Similarly, students of grade 6 improved their score in post-test by 20.6% while the students of grade 7 improved by 23.4% (Fig. 4b). However, the

improvement of the students was not statistically significant with respect to grades. The comparative low pre-test scores of students of both grades show the lack

of general knowledge and awareness about turtles. However, the increase in post-test scores shows that the conservation education program was equally effective for students of both grades. The presentations were delivered with clarity and simplicity, ensuring that students could easily understand the content. Additionally, students were offered guidance and support when they encountered any confusion or difficulties with the test questions. This could be a contributing factor to the fact that the pupils in two distinct grade levels did not have a significant difference in their scores. The students scored high during post-test as they became familiar with the test process (Dimopoulos et al., 2008). As the students from both grades have participated in the pre-test and the topics were discussed during the presentation, the improvement was not affected by the grades they were studying. Educational programs can bring more positive impact and work effectively if they are designed based

on specific grade levels considering the learning capacity of students (Carvalho et al., 2020).

The pre-test score showed a significant association with the change in score of students (Table 3). The negative slope of the regression line (Fig. 5) indicates a declining change in scores as the pre-test score increases. This implies that students who scored higher in the pre-test tend to show less improvement in the subsequent scores. Students who achieve higher marks on the pre-test are already performing at a good level, which limits the potential for significant improvement in their subsequent scores. Conversely, students with lower pre-test scores have more room for improvement, leading to a greater change in their scores. This suggests that those starting with weaker performance are likely to experience more noticeable gains as they have a larger gap to bridge in their learning.

Table 3 Regression analysis of change in percentage scores of students

	Estimate	Std. Error	t value	p-value
(Intercept)	40.2785	6.3045	6.389	<0.05
Gender Male	-6.0869	4.0275	-1.511	0.1357
Pre_test_score	-0.4174	0.1522	-2.742	0.0079

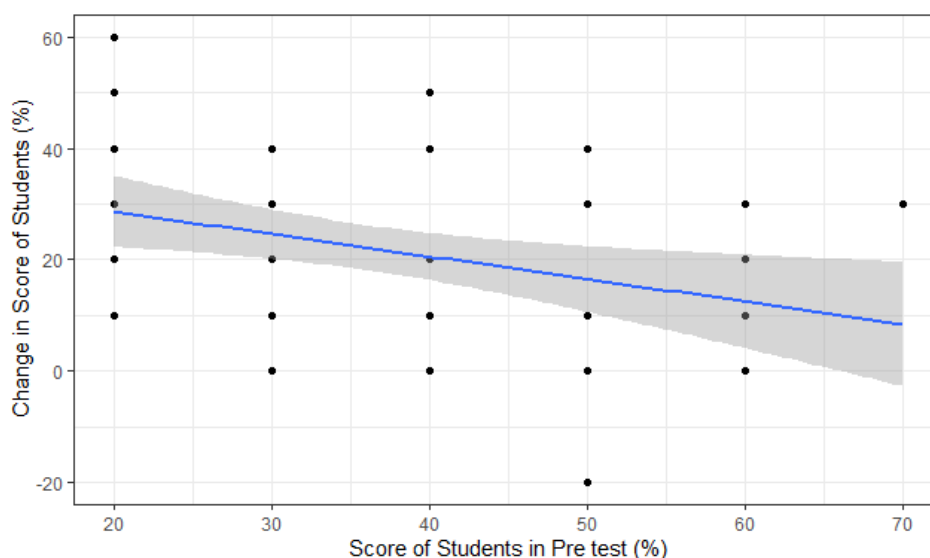


Figure 5 Scatter Plot with Regression line showing the relationship between pre-test scores and change in student performance.

Along with the score of the students, the grade of the score in which they belong was also changed. Participants initially classified in category B during the pre-test progressed to category A in the post-test, and no participants remained in category E in the post-test (Fig. 6). About 25% of participants (16 out of 66) received Grade A in the post-test which shows a notable improvement since no one had scored that high in the pre-test. Meanwhile, 23 students achieved Grade C in the post-test, contrasting with the pre-test, where the majority 32 students received Grade D. Additionally, the

number of students scoring the lowest grade dropped notably, with only 7 students (10.61%) earning Grade D in the post-test. The change in the grade of students was statistically significant ($\chi^2 = 21.544$, $df = 9$, $p = 0.0104$).

Environmental education was effective in our case and this effectiveness aligned with some studies while contradicting with that of others. For instance, when school students of Malaysia were introduced to the concepts of marine turtles through various activities, their knowledge was found to be enhanced (Ismail et al.,

2021). However, another study from Malaysia showed opposite results where students were introduced to the concepts of ecosystems and ecosystem services, however, their level of knowledge did not improve significantly in the post-assessment (Kamaludin et al., 2022). In the program, we integrated the multitude of activities including audio-visual and quizzes with the

game and students were showing keen interest to learn about the turtles. As a result, the knowledge level was enhanced. Other scholars also support the role of environmental education to enhance the knowledge of children but highlight their limitation to improve the attitude or behavior (Grúňová et al., 2017).

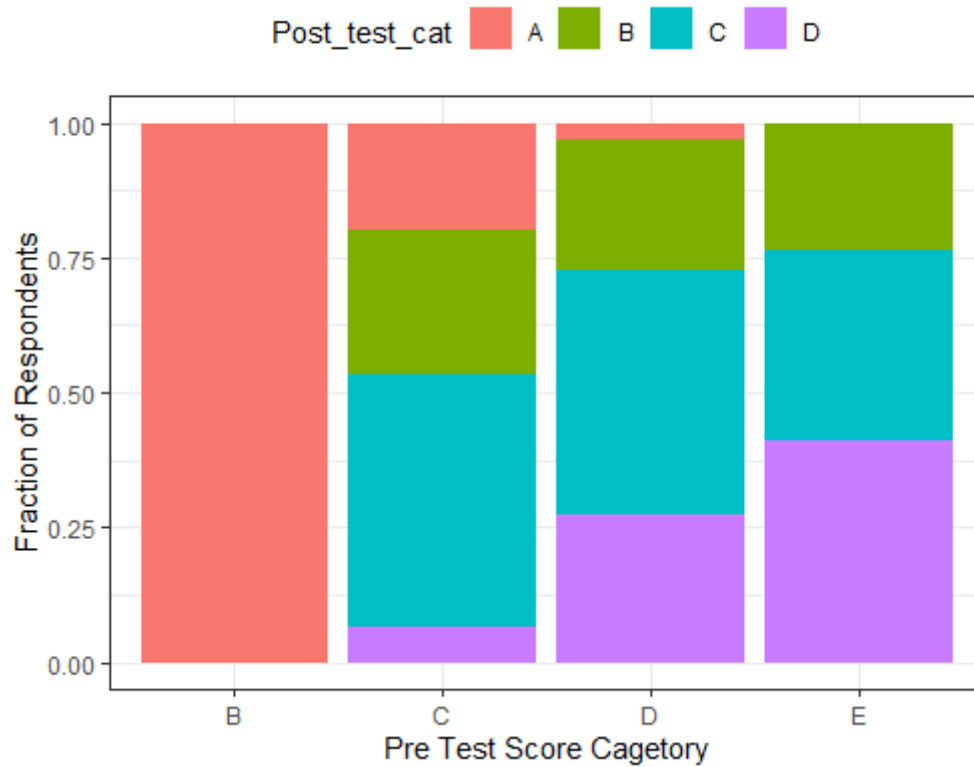


Figure 6 The score category of the students in pre- and post-tests.

The attitude of people towards any animal species depends upon factors like individuals' basic values, cultural and religious associations, interactions and knowledge about that particular species (Grúňová et al., 2017). With the increase in knowledge about terrapins, there is change in behavior of people towards the conservation of the species (Camara & Jamil, 2021). Thus, more programs can be designed for individuals living in close proximity with turtles so that awareness can be raised in the participants who will later spread knowledge among non-participants and develop the sense of stewardship towards turtles in the community.

Nepal has adopted the sustainable development goals, and the outcomes of this study align with broader national and international conservation priorities, particularly the United Nations Sustainable Development Goals (GoN/NPC, 2017). Specifically, the study supports SDG 4 (Quality Education) by promoting inclusive and effective environmental education and SDG 15 (Life on Land) by contributing to the conservation of threatened wildlife species such as turtles. Strengthening conservation education at the

school level can therefore play a complementary role in achieving biodiversity conservation goals in Nepal.

Based on the findings, it is recommended that turtle-focused conservation education programs be integrated into formal school curricula and expanded to other buffer zones and conservation landscapes in Nepal. Future programs could be strengthened by incorporating long-term follow-up assessments, teacher training components, and community engagement strategies to enhance sustained conservation outcomes. However, before generalizing the findings of this study, we have to be cautious. For instance, this study is a case of one local school of Chitwan with periodic conservation activities which might not be the case elsewhere. Furthermore, the time difference between the pre and post-test assessment is a few hours due to some logistic constraints. Thus, we are not in position to say anything about the long-term implication in the knowledge of the students. Along with this, our study could not assess the change in attitudes of participants as it was a one-day program and societal implication of knowledge cannot be assessed in the short term. Therefore, further studies should focus on

incorporating the long-term impact of the school-based awareness program in changing attitude as well as knowledge of the students.

Conclusions

This study demonstrated that a turtle-focused, school-based conservation education program can significantly improve students' knowledge and awareness of turtle ecology and conservation. The findings highlight the effectiveness of targeted environmental education in addressing knowledge gaps related to non-charismatic species, which are often overlooked in conventional conservation initiatives. By engaging school-aged children, the program contributes to fostering positive conservation attitudes at an early stage, which is critical for long-term behavioral change and biodiversity protection.

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Conflict of Interest: The authors declare no conflicts of interest while publishing this paper.

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