IMPACT OF BIRD WATCHING ACTIVITIES ON LEARNING BIOLOGICAL SYSTEMATIC TERMS

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ABSTRACT

Students learn biology by bird watching. The various activities of bird watching contribute to improving the biological knowledge on birds. A number of biological terms can be easily learned by students in such activities. The contribution level of structured bird watching activities on student knowledge is investigated in this study. Batches of students consisting of 120 undergraduate biology students were divided to almost equally three groups. Group I joined to only classroom course; group II joined only bird watching activities under the guidance of an expert and group III joined classroom courses along with bird watching courses. The various biological terms were explained with examples in both the courses. The students took a test related to 25 terms of systematics after courses. The test was evaluated for 25 points; each term carrying one point. The students of group III who joined both the courses have highest achievement (91.64%) while the average test scores of the other two groups were 66.64% and 82.64% respectively.

The results show that the coupled courses have positive impact on learning of biological terms. Moreover, only bird watching activities show more effective result than only classroom courses according to the study results. In conclusion, the outdoor educational activities such as bird watching can be effective way of learning biological terms.

KEY WORDS:
Birdwatching, systematics, outdoor learning, biological terms, RIE Campus, biodiversity

INTRODUCTION

Bird watching is an increasingly popular leisure activity (Wilkinson, *et al.,* 2014). Bird watching or birding is a recreational as well as an educational activity. It involves observation of birds, with the naked eye, or through a visual enhancement device like binoculars, or by listening for bird sounds (Barker, *et al.,* 2002) or by watching public webcams. Identification of birds is important in diagnosis of the environment and their conservation status. Birds can be identified by their size, colour, beak, tail, calls they make, niches they occupy and time of sighting (Tangpu & Gopal, 2014). Bird watching is often pursued by non-academic non biologists, rather by people from different field of professions. Most birdwatchers pursue this activity for recreational or social reasons, unlike ornithologists, who engage in the study of birds using formal scientific methods.

Systematics is the study of the units of biodiversity. It includes biodiversity of species, classification, taxonomy and the application of this pattern knowledge to studying changes in organismal features through time (Claridge, 1995). Biological systematic terms include species, category, taxon, nomenclature and characteristics through observation, identification and classification.

The informal outdoor education and activities can be effective way to advance learning in science (Knapp and Barrie, 2001). Outdoor learning in biology most often take place at specific places away from ordinary school surroundings, as field trips or visits to outdoor/environmental education centers (Fägerstam & Blom, 2013). Biology has traditionally had strong connections with fieldwork and outdoor education activities dating back to early naturalists (Cotton, 2009).

Previous research indicates that learning biology outdoors might have positive effects on both knowledge and attitudes toward biology (Fägerstam & Blom, 2013). However, fieldwork can improve student's better retention of acquired knowledge (Nundy, 1999); enhanced motivation and higher-order learning and development of practical skills (Kent *et al,* 1997). Birdwatching is a form of wildlife observation in which the observation of birds is a recreational activity. It can be done with the naked eye, through a visual enhancement device like binoculars and telescopes, by listening for bird sounds. Birding activities may be designed to address several goals of the science curriculum: adaptation, comparing and contrasting animals and animal life cycles, to name a few.

The objective of the present study is to investigate the effect of bird watching activities on the learning systematic terms in biology lessons. The present study is also intended to investigate whether outdoor activities like bird watching enhance the learning or biological systematics and whether bird watching activities are better than classical classroom course study.

MATERIALS AND METHODS

This study was conducted at RIE, Mysuru for 3 consecutive years from 2017 to 2019. Data were gathered from the CBZ students of B.Sc.B.Ed course of Regional Institute of Education, Mysuru. To evaluate the impact of the study on students' knowledge toward the systematic terms, an experimental design was implemented using an evaluation instrument that included 25 open ended questions. The undergraduate CBZ students of B.Sc.B.Ed course participated in this study as the syllabi on Animal Diversity – III demands field study on birds. 40 students in each year were selected and split to three groups which are almost equal in terms of numbers of student; each group consists of 12-14 students, as shown in Tables 1, 2 and 3.

Table 1: Characteristics of each group (2017)

Group	Number of Students (N)	Age	Gender Distribution (F:M)
I	13	19-21	11:2
II	13	19-21	11:2
III	14	19-21	12:2

Table 2: Characteristics of each group (2018)

Group	Number of Students (N)	Age	Gender Distribution (F:M)
I	14	19-21	12:2
II	13	19-21	11:2
III	13	19-21	13:0

Table 3: Characteristics of each group (2019)

Group	Number of Students (N)	Age	Gender Distribution (F:M)
I	13	19-21	11:2
II	13	19-21	10:3
III	14	19-21	11:3

Table 4 describes the sequential steps involved in this study. Each group took the same test (pre-test) which consists of 25 open ended questions about systematic terms, prior to attending the bird watching activities. After the pre-test, the first and third groups attended a presentation class (lectures/ chalk & talk) together in related to systematics. Within one month time, the second and third groups joined to bird watching activities together. All groups took the same test (post-test) again next to the end of the course program (Table 4).

At the end of the program it was expected that students would be able to describe the systematic terms; biological species, genus, family, order, class, phylum, kingdom, bipedality, feathered friends, avian characters, sexual dimorphism, scientific name, common name, vernacular name, nocturnal, diurnal, clutch, retrices, remiges, migratory

bird, resident bird, IUCN conservation status, habit, and habitat. To easily evaluate the test results, each question carries 1 mark, the total marks of the test was 25.

The questions were:

1. Explain the term "Biological species" with an example.
2. Write the binomial nomenclature of any bird found in RIE Campus.
3. What is meant by 'bipedality'?
4. What does 'Tetrapod' mean in vertebrate systematics?
5. What is the difference between category and taxon?
6. Which is one diagnostic feature of birds?
7. How can one easily identify a bird?
8. Cite an example of sexual dimorphism in avian population.
9. How is common name different from scientific name?
10. Give a vernacular name for a house crow.
11. Cite one example of a nocturnal bird.
12. What is the clutch size of a Tickle's Blue fly catcher?
13. What is a retrex?
14. Where are remiges found?
15. Cite one example for a migratory bird to RIE Campus.
16. Which is a resident bird of RIE Campus?
17. Give an IUCN conservation status for a White breasted Kingfisher.
18. What does a Purple rumped Sun bird feed upon?
19. Where is black Drongo sighted in RIE Campus?
20. Is Phylum a taxon?
21. Write down 3 mandatory rules for writing binomial nomenclature.
22. How many obligatory categories are followed in biological classification?
23. How is female Asian koel different from that of male?
24. Taking an example of a tree ecosystem, show the inverted pyramid.
25. Which is the first order of category in systematic position?

Different statistical tests were used to investigate each group performances: pre– and post–tests. To compare and evaluate the gathered data, following tests were used; scores and percentage of the scores, determining for distributions of mean value; independent sample *t* – test for differences between the three groups.

Table 4: The steps of study design; there are 8 weeks gap between first and last steps.

Step	Group I	Group II	Group III
1	Pre - test	Pre - test	Pre - Test
2	Classroom Course	-	Classroom Course
3	-	Bird watching	Bird watching
4	Post – Test	Post – Test	Post – Test

RESULTS

The results of the present study are shown in Tables 5, 6 & 7. The number of birds observed in RIE Mysuru campus during 2017 – 2019 (Table 5), total scores of the students (Table 6), percentage scores (Table 7) and percentage scores of the students in groups I, II & III (Fig.1) are explicitly shown in the results.

Table 5: Total Number of bird species Observed (NOBO) by groups and number of systematic terms Explained (NOSE)

Days of Bird watching	Total Number of Birds Observed in RIE Campus	
	NOBO	NOSE
1	22	5
2	17	6
3	19	4
4	20	7
TOTAL	**35***	**7***

*Total count of bird species/ systematics explained in 4 different days of birdwatching

Table 6: Total Scores of the students (2017 – 2019 Batches) on the 25 Point Scale

Gp	2017 Batch		2018 Batch		2019 Batch		Total	
	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test
I	3.15±1.54*	16.43±1.82[a]	3.11±0.94*	16.44±0.82[a]	3.35±1.14*	17.05±1.25[a]	3.20 ± 0.13*	16.64 ± 0.36[a]
II	3.08±0.74*	20.45±0.82[a,b]	3.41±0.85*	20.92±0.82[a,b]	3.07±0.77*	20.60±0.86[a,b]	3.19 ± 0.19*	20.66 ± 0.24[a,b]
III	3.54±1.54*	22.66±1.01[a,b,c]	3.44±0.94*	23.02±0.63[a,b,c]	3.84±1.14*	23.07±0.69[a,b,c]	3.61 ± 0.21*	22.92 ± 0.23[a,b,c]
%	13.03	79.39	13.28	80.51	13.68	80.96	13.33	80.32

Student's *t*-test: *No significant difference among pre-test scores; [a] Significant difference from respective pre-test scores at $p<0.05$, [b] Significant difference from group I (Only Course) at $p<0.05$, [c] Significant difference from group I (Only Course) and group II (Only bird watching) at $p<0.05$

Table 7: Percentage Scores of the students (2017 – 2019 Batches) for the 25 Point Scale

Group	Total Scores (2017, 2018 & 2019)		Percentage (%)	
	Pre-Test	Post-Test	Pre-Test	Post-Test
I	3.20 ± 0.13*	16.66 ± 0.53[a]	12.8	66.64
II	3.19 ± 0.19*	20.66 ± 0.30[a,b]	12.76	82.64
III	3.61 ± 0.21*	22.92 ± 0.20[a,b,c]	14.44	91.68

Student's *t*-test: *No significant difference among pre-test scores; [a] Significant difference from respective pre-test scores at $p<0.05$, [b] Significant difference from group I (Only Course) at $p<0.05$, [c] Significant difference from group I (Only Course) and group II (Only bird watching) at $p<0.05$

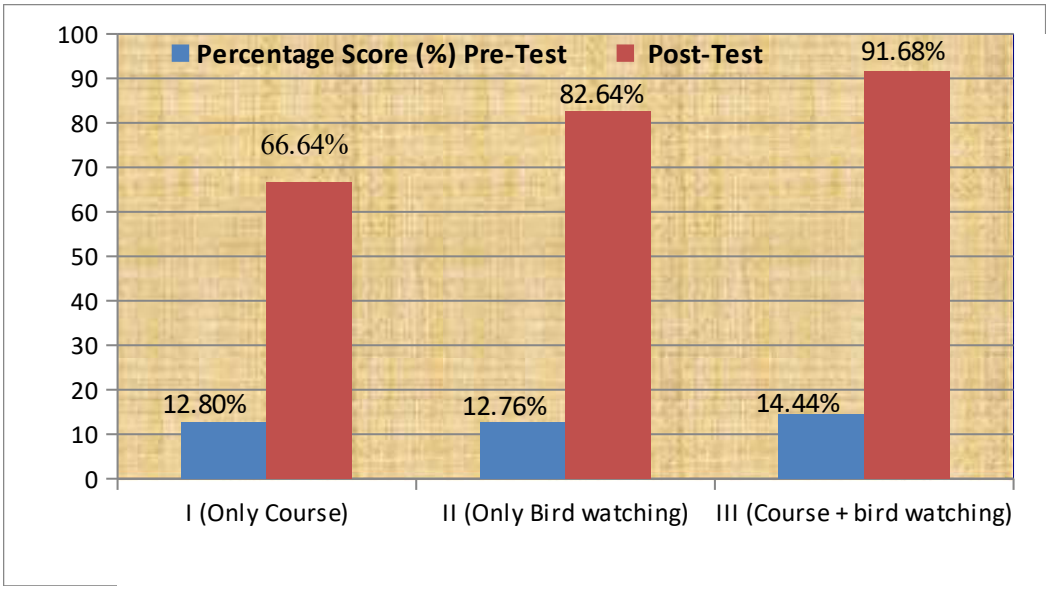

Fig.1: Percentage Scores (%) of the students in groups I, II and III

According to the pre-test results shown in Tables 5, 6 and 7, the average scores of the groups and batches are close to each other. In terms of group scores, all the questions were in normal distribution and there was no statistically difference between the students according to their average scores ($p > 0.05$). The average scores of the groups I, II and III are 3.20 ± 0.13 (12.80%), 3.19 ± 0.19 (12.76%) and 3.61 ± 0.21 (14.44%) respectively. There was no statistically significant difference between the groups in terms of the results of the pre-test, though the third group was more successful than the other two groups.

The difference between the lowest and highest mean-scores of groups is 0.41. This low score difference is another proof that students do not differ from each other in terms of preliminary information. According to the test results, the average scores from the questions are not dependent on the gender and the batches of the students.

The second and third group participated in bird watching activities. The number of species observed by the days in which the groups participated is shown in Table 5. At the end of four different observation days, the students on the first day observed 22, second day 17, third day 19 and the fourth day 20 bird species. In all the days, systematic terms were explained with appropriate examples. In terms of these results, it can be said that the groups who participated in birdwatching observed enough bird species. In each

activity day, different terms were tried to explain to the students with examples. The number of different systematic terms explained are biological species, genus, family, order, class, phylum, kingdom, bipedality, feathered friends, avian characters, sexual dimorphism, scientific name, common name, vernacular name, nocturnal, diurnal, clutch, retrices, remiges, migratory bird, resident bird, IUCN conservation status, habit, and habitat.

After bird watching activities, all groups took to the same test again. As expected here, the students were highly successful compared to the pre-test (Table 7). Similarly, the post-test shows normal distribution of the scores from the questions, and gender is not a statistically significant factor on the scores ($p < 0.05$). According to the results of the post-test, the average score of the third group participating in both courses and bird watching activities is statistically different from the others ($p < 0.05$). Although, the first group increased the percentage score from 12.80% to 66.64%, there is a significant increase in success of the second group from 12.76% to 82.64%. However, the change in success of the third group is found to be the highest from 14.44% to 91.68%. Therefore, there is a significant difference in groups I and II, and the results of group III (course + bird watching) show significant change comparing to both group I (only course) and group II (only bird watching).

DISCUSSION

The results show that students participating in both the classroom and the outdoor activities are most successful than the students who participate either only in the open field or only in the classroom course study. The third group is most successful than the other two groups which indicates that participation in course study coupled with field activities enhance their learning capacity and practical field activities can retain more memory in learning. Though classical classroom learning also yields good percentage of scoring points, outdoor activities can produce better results when it comes to scoring points in the tests. As indicated by the second group where only bird watching activities yields better results, the highest scoring comes from the third groups where students were exposed to both classroom course study as well as outdoor activity of bird watching. The findings of a study (Lock, 2010) suggest that fieldwork provision in biology is declining and concludes by identifying the implications for researchers, policy formers and those responsible for pre-service teacher training. The students involved in this study are also the teachers in the preparation. The teachers can become the guides who motivate the children to take up field studies and nature watch such as bird watching.

Although the number of students enrolling in Biological Science courses has increased, the courses are shifting away from the inclusion of outdoor learning activities. The reasons given by tutors regarding the benefits and problems of running higher education fieldwork courses includes offering more overseas trips and adopting inter-disciplinary and inter-institutional approaches (Smith, 2004). A similar study also suggests that bird watching activities enhance the success of the learning biological terms (Arikan & Turan, 2017).

It can be concluded that bird watching activities enhance the learning among undergraduate students in biological systematics, as field activities not only motivate the interest of the learners, but also retain the learning and enhancing their performances in the examinations.

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Ethical statement:

1. Disclosure of potential conflicts of interest:

a) Funding: There is no funding involved in this study.

b) Conflict of Interest: The author declares that there is no conflict of interest.

2. Research involving human participants and/ or animals

a) Statement of human rights: "For this type of study formal consent is not required."

b) Statement on the welfare of animals: "This chapter does not contain any studies with animals performed by any of the authors."

3. Informed Consent: "Informed consent was obtained from all individual participants included in the study."

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