



INTERNATIONAL JOURNAL OF TRENDS IN EMERGING RESEARCH AND DEVELOPMENT

INTERNATIONAL JOURNAL OF TRENDS IN EMERGING RESEARCH AND DEVELOPMENT

Volume 4; Issue 5; 2026; Page No. 55-58

Received: 18-06-2026

Accepted: 26-08-2026

Published: 27-09-2026

Integrating Biodiversity Education into English Language Teaching: Developing Scientific Literacy and Environmental Awareness among Higher Secondary Students in Jammu and Kashmir

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DOI: <https://doi.org/10.5281/zenodo.23057038>

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Abstract

Biodiversity education can help students understand living organisms, ecological relationships and the importance of conservation. Yet biodiversity is often taught mainly through science subjects, while English language lessons may focus on language skills without consistently using locally meaningful scientific content. This article develops an interdisciplinary framework for integrating biodiversity themes into English Language Teaching (ELT) for higher secondary students, with particular reference to Bhalessa, Jammu and Kashmir. Using a literature-informed conceptual approach, it connects research on biodiversity education and sustainability-oriented language teaching with classroom practices such as reading, vocabulary development, nature writing, observation reports, debates and group presentations. The framework distinguishes language outcomes from scientific outcomes and proposes a practical assessment structure for teachers. It also considers curriculum time, teacher collaboration, resource availability and scientific accuracy. The article does not report original student data or claim that the framework has been experimentally tested. Instead, it offers a locally adaptable proposal that can guide future classroom-based research into language development, biodiversity knowledge and environmental communication.

Keywords: Biodiversity education, English Language Teaching, Zoology, scientific literacy, environmental awareness, interdisciplinary learning, higher secondary education, Jammu and Kashmir

1. Introduction

Biodiversity-the variety of living organisms and the ecological systems in which they occur-is closely connected with environmental stability and human well-being. Understanding biodiversity involves recognising the characteristics of organisms, the habitats they depend on, and the relationships that connect species within ecosystems. Education can help students build this understanding and consider how human activities affect the natural world.

Biodiversity is commonly addressed in biology and related subjects, but its educational value extends beyond science

classrooms. English language lessons provide structured opportunities to read information, interpret descriptions, explain ideas, compare evidence and communicate conclusions. When carefully selected environmental content is used for these purposes, language learning can be connected with scientific literacy without losing its language-learning focus.

The natural and cultural surroundings of Bhalessa, Jammu and Kashmir, offer a relevant context for exploring themes such as habitats, plant diversity, birds, insects, forests, water resources and conservation. Local examples Biodiversity Education and English Language Teaching should be

verified through reliable sources and, where needed, by a qualified biology or Zoology teacher. The central proposition of this article is that biodiversity can function as a shared theme through which English communication skills and understanding of living systems are developed together.

2. Statement of the Problem

English and Zoology are often planned and assessed as separate subjects. English teaching may emphasise reading, grammar, writing and speaking, while Zoology focuses on biological concepts, organisms and ecological processes. This division is understandable, but it can leave opportunities for interdisciplinary learning underused. Students may know a biological concept yet struggle to explain it clearly, or they may practise English through texts that feel distant from their immediate environment.

This article addresses the pedagogical question of how biodiversity-related material can be incorporated into English lessons while preserving clear language objectives and scientific accuracy. It proposes a framework rather than reporting the results of an intervention.

3. Objectives

- To examine the educational connection between biodiversity education and English Language Teaching.
- To identify classroom activities that link language skills with biological and ecological concepts.
- To propose a locally adaptable framework for higher secondary students in Bhalessa, Jammu and Kashmir.
- To distinguish language-learning outcomes from scientific understanding and environmental communication.
- To identify implementation challenges and suggest directions for future empirical research.

4. Research Questions

- How can biodiversity content be incorporated into English Language Teaching at the higher secondary level?
- Which language activities can help students communicate biological and environmental ideas accurately?
- How may local environmental themes provide meaningful contexts for interdisciplinary learning?
- What practical challenges may arise when English and Zoology teachers plan activities together?
- How could future research evaluate language and biodiversity outcomes separately?

5. Review of Related Literature

5.1 Biodiversity education and active learning

Biodiversity education aims to develop knowledge of living organisms, their habitats and the relationships that sustain ecosystems. Students benefit from opportunities to observe, compare, classify and discuss biological phenomena, rather than relying exclusively on memorisation. Randler *et al.* (2018) ^[2] examine teaching methods used to promote biodiversity education and discuss approaches that engage learners actively with biological content. Such work supports the educational value of connecting scientific concepts with meaningful learning activities.

5.2 Sustainability in English Language Teaching

Environmental and sustainability themes can be used in English lessons to support reading comprehension, vocabulary, structured writing, oral communication and critical discussion. Yu *et al.* (2024) ^[4] discuss ways in which sustainability can be incorporated into English Language Teaching. A literature review by Dhanyamol and Sethunarayanan (2025) ^[1] also examines strategies for integrating environmental sustainability into ELT, including the use of relevant texts and project-based activities. These approaches provide a basis for treating environmental content as a context for language learning, rather than as a substitute for explicit language instruction. Biodiversity Education and English Language Teaching.

5.3 Language and scientific literacy

Scientific literacy requires learners to interpret information, understand concepts, consider evidence and communicate explanations. Language is involved in each of these activities. A student explaining a food chain, summarising a passage on pollination or writing an observation report must organise ideas and use terminology appropriately. Collaboration between English and Zoology teachers can help maintain a balance: the English teacher supports expression and organisation, while the Zoology teacher checks the scientific meaning.

5.4 Rationale for the present framework

The literature discussed above establishes relevant connections between biodiversity learning and sustainability-oriented language education. It does not, by itself, demonstrate the effectiveness of a particular programme in Bhalessa. The contribution of this article is therefore a proposed framework tailored to higher secondary teaching, with explicit activities, outcomes and assessment considerations.

6. Methodology

6.1 Research approach

This article uses a literature-informed conceptual approach. It synthesises selected published work on biodiversity education and sustainability in ELT to develop an interdisciplinary teaching framework. It is not presented as a systematic review because no formal database search protocol, screening process or study-quality assessment has been completed for this manuscript.

6.2 Scope and context

The framework is intended for higher secondary students, including Classes XI and XII, subject to the applicable syllabus and school requirements. Bhalessa, Jammu and Kashmir, is used as a contextual setting for selecting relevant environmental themes. Any claims about local species, habitats or conservation status should be verified using authoritative sources before classroom use.

6.3 Roles of the two subject areas

English Language Teaching contributes reading comprehension, vocabulary, writing, speaking, listening and the organisation of ideas. Zoology contributes biological concepts, ecological relationships, appropriate terminology

and the verification of scientific information. Joint planning allows each teacher to contribute expertise while keeping the learning objectives clear.

7. Proposed Interdisciplinary Teaching Framework

The framework follows a simple sequence: select a verified biodiversity theme; define one or more English language objectives; identify the biological concepts to be learned; conduct an appropriate classroom activity; and assess language and scientific understanding separately.

Activity English objective Zoology/environment objective
Reading passage Comprehension, inference, summarizing
Understand species, habitats or ecological relationships

Vocabulary journal Use subject-specific words in context
Understand biological terminology
Observation report Descriptive and report writing
Record observable features carefully
Group presentation Speaking, organisation and clarity
Explain a biological concept accurately
Classroom debate Argumentation and evidence-based speaking
Consider conservation questions
Poster or awareness message Concise, audience-aware language
Communicate a conservation message
Collaborative project Research writing and referencing
Investigate a selected biodiversity theme
Biodiversity Education and English Language Teaching.

Table 1: Activity, English objective and Zoology/environment objective

Activity	English objective	Zoology/environment objective
Reading passage	Comprehension, inference, summarizing	Understand species, habitats or ecological relationships
Vocabulary journal	Use subject-specific words in context	Understand biological terminology
Observation report	Descriptive and report writing	Record observable features carefully
Group presentation	Speaking, organisation and clarity	Explain a biological concept accurately
Classroom debate	Argumentation and evidence-based speaking	Consider conservation questions
Poster or awareness message	Concise, audience-aware language	Communicate a conservation message
Collaborative project	Research writing and referencing	Investigate a selected biodiversity theme

7.1 Reading comprehension through biodiversity texts

Teachers can select an age-appropriate passage on habitats, pollination, food chains, species diversity or conservation. Students can identify the main idea, infer meanings from context, distinguish key points from examples and write a short summary. Texts should come from reliable sources or be prepared and checked jointly by the teachers.

7.2 Scientific vocabulary in context

Students can maintain a vocabulary journal containing terms such as biodiversity, habitat, ecosystem, adaptation, predator, prey, pollination and conservation. For each term, students can write a concise definition and an original sentence. The activity should emphasise meaning and appropriate use rather than memorisation alone.

7.3 Nature writing and observation reports

Students may describe an organism or habitat that can be observed safely in the school surroundings. A report can include the date and general location, observable characteristics, a description, and a short explanation based on verified information. Students should distinguish direct observation from information obtained from books or websites. They should not collect or handle wild organisms without appropriate expertise and permission.

7.4 Debate and oral presentation

Possible debate topics include the role of schools in biodiversity conservation, the importance of protecting habitats and the responsibilities of visitors in natural areas. Students should support claims with evidence, listen respectfully and avoid presenting unsupported statements as facts. Short group presentations can help students practice pronunciation, sequencing and clear explanations.

7.5 Collaborative projects

Small groups can investigate a topic such as pollinators, habitat conservation, responsible tourism or waste and wildlife. Each group can formulate a question, consult reliable sources, prepare a short report and present its conclusions. Field activities require school approval, appropriate supervision and any necessary parental consent.

8. Proposed Assessment Framework

Assessment should measure English language performance and scientific understanding as related but distinct outcomes. The following rubric is a proposed classroom tool and has not been validated through research. A future classroom study could use pre- and post-instruction tasks to examine reading comprehension, scientific vocabulary, writing quality and biodiversity knowledge. Any claims of improvement would need to be based on collected data, transparent analysis and appropriate ethical permissions.

9. Potential Contributions

The framework may provide meaningful contexts for language practice by connecting classroom tasks to environmental themes familiar to students. It may also encourage collaboration between English and Zoology teachers and help students practise communicating scientific ideas to different audiences. Locally relevant content may support engagement, provided that the examples are accurate and the activities are appropriate to students' age, language proficiency and curriculum. Biodiversity Education and English Language Teaching.

These contributions are possibilities to be evaluated, not findings from an intervention conducted by the authors. Outcomes will depend on instructional design, teacher preparation, available resources and student participation.

Criterion	Marks
Scientific accuracy	25
English language use and vocabulary	25
Organisation and clarity	20
Evidence and use of reliable sources	15
Presentation and participation	15
Total	100

10. Challenges and Limitations

10.1 Curriculum and time

Teachers may have limited time to complete prescribed syllabi. Activities should therefore reinforce existing language and science objectives rather than become unrelated additions. (Sudhakar H, 2025) ^[5].

10.2 Teacher collaboration and resources

Joint planning requires time and coordination. Some schools may have limited access to field guides, digital resources or specialist materials. Teacher-prepared passages and safe observations can provide practical alternatives.

10.3 Language proficiency and scientific accuracy

Students may need glossaries, sentence starters or bilingual support. At the same time, simplification must not distort biological concepts. Scientific terms and claims should be checked by a qualified subject teacher.

10.4 Limitations of the article

This manuscript presents a proposed framework informed by selected literature. It does not report original field data, student responses, statistical analysis or an experimentally tested intervention. The effectiveness of the framework remains an open research question.

11. Recommendations

- Select biodiversity themes that align with existing syllabus objectives.
- Develop reading and writing materials from reliable sources and check scientific claims.
- Plan activities jointly so that language and Zoology objectives remain explicit.
- Assess language skills and biological understanding separately.
- Obtain school approval and required consent for any student research or fieldwork.
- Conduct future classroom studies with transparent sampling, suitable instruments and clearly reported limitations.
- Avoid claiming that awareness, behaviour or achievement improved unless the collected evidence supports that conclusion.

12. Conclusion

Biodiversity education offers a meaningful theme for connecting English Language Teaching with scientific literacy and environmental communication. Reading passages, vocabulary journals, observation reports, debates and collaborative projects can create opportunities for students to practise English while exploring biological ideas. For higher secondary education in Bhalessa, Jammu and Kashmir, the proposed framework offers a locally adaptable approach that preserves the distinct contributions

of English and Zoology. Its effectiveness should be examined through future empirical research that measures language outcomes and biodiversity understanding separately.

13. References

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