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Research Article

IMPROVING GRAMMATICAL COMPETENCE OF BIOLOGY STUDENTS THROUGH CLIL TECHNOLOGY IN HIGHER EDUCATION

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ABSTRACT

The internationalization of higher education has made English grammar a practical necessity for biology students who read research texts, interpret laboratory instructions, and describe scientific processes. This article examines how grammatical competence can be improved through Content and Language Integrated Learning (CLIL) in higher education. The study draws on the analysis of Uzbek and foreign methodological literature and develops a subject-oriented instructional model for biology classrooms. The proposed model combines content-rich input, guided noticing of target forms, scaffolded grammar practice, and productive academic output. Particular attention is given to grammatical structures that are frequent in bioscience discourse, including present and past passive forms, cause-and-effect patterns, comparative structures, modal verbs, and conditionals. The analysis shows that grammar becomes more meaningful and durable when it is taught through biological content rather than as isolated rules. CLIL-based instruction strengthens the connection between linguistic accuracy, scientific thinking, and professional communication, and therefore offers an effective methodological basis for teaching grammar to biology students.

Keywords: CLIL, Grammatical competence, Biology students, Higher education, ESP.

INTRODUCTION

In higher education, biology students increasingly study through English-medium textbooks, research articles, laboratory manuals, and digital resources. They are expected to identify taxonomic features, explain biological processes, compare data, and describe experimental procedures in English. Under these conditions, grammatical competence becomes part of academic and professional readiness rather than a secondary language skill (Canale, M and Swain, M. 1980. Theoretical bases of communicative approaches to second language teaching and testing. Applied Linguistics. 1(1): 1-47). However, grammar instruction in many non-linguistic programs still depends on rule explanation and decontextualized sentence exercises. Such practice may help students recognize forms, yet it often leaves them unable to write a concise laboratory report, describe a mechanism clearly, or interpret scientific statements with confidence. The problem is especially visible among biology students, whose future work requires accuracy, precision, and discipline-specific language patterns. Content and Language Integrated Learning (CLIL) offer a productive response to this challenge. The central idea of CLIL is that language is learned more effectively when it is used for meaningful subject learning, while subject knowledge becomes deeper when students work through the language needed to express it. In this framework, grammar is not taught as an isolated system. Instead, it is introduced as a resource for explaining classification, sequence, comparison, cause, result, and hypothesis in a biology-related context (Dalton-Puffer, C. 2007. Discourse in Content and Language Integrated Learning (CLIL) Classrooms. John Benjamins, Amsterdam).

Foreign scholarship has established the theoretical value of integrating language and content. Coyle, Hood and Marsh emphasize that successful CLIL instruction relies on the coordinated development of content, communication, cognition, and culture. Dalton-Puffer, Llinares and other

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researchers have shown that CLIL classrooms promote academic discourse and contextual language growth. In grammar pedagogy, Larsen-Freeman, Ellis, and Nassaji argue that learners acquire grammar more successfully when form is linked to meaning and use.

Uzbek methodological literature also supports the need for professionally oriented and communicative foreign language instruction. Jalolov and other Uzbek scholars stress that language teaching in higher education should be practical, learner-centered, and connected with future professional activity. Recent Uzbek discussions of CLIL similarly underline the value of interdisciplinary integration, although the specific issue of developing grammatical competence among biology students still requires fuller methodological elaboration. The aim of this article is to substantiate a CLIL-based methodology for improving the grammatical competence of biology students in higher education. The article argues that grammar becomes more functional, memorable, and professionally relevant when it is embedded in bioscience content and practiced through meaningful academic tasks (Larsen-Freeman, D. 2003. Teaching Language: From Grammar to Grammaring. Heinle, Boston).

MATERIAL AND METHOD

The present study is theoretical and methodological in character. It is based on the analysis, comparison, and synthesis of Uzbek and foreign literature on CLIL, grammatical competence, English for Specific Purposes, and higher education language pedagogy. The descriptive method was used to determine which grammatical structures are most relevant to biology-oriented academic communication. To adapt grammar instruction to bioscience education, the study identifies common communicative situations faced by biology students: defining concepts, classifying organisms, describing structures, reporting laboratory procedures, explaining processes, comparing species or ecosystems, and formulating hypotheses. These situations guided the selection of grammar content and the design of instructional stages (Llinares, A., Morton, T. and Whittaker, R. 2012. The Roles of Language in CLIL. Cambridge University Press, Cambridge).

The target grammatical material includes present simple and present passive forms for definitions and process descriptions; past simple and past passive forms for completed experiments; modal verbs for necessity, possibility, and recommendation; comparative and superlative forms for analytical comparison; cause-and-effect constructions for explaining mechanisms; relative clauses and extended noun phrases for precise scientific description; and conditionals for prediction and hypothesis building. On this basis, a four-stage instructional model was developed. The first stage is content-rich input, where students work with short biology texts, diagrams, data tables, or laboratory instructions containing the target structures. The second stage is guided noticing, in which learners identify recurrent forms and discuss why they are used in that scientific context. The third stage is scaffolded practice through completion, transformation, matching, and reconstruction tasks. The fourth stage is productive academic output, where students apply the target grammar in mini-reports, oral explanations, diagram descriptions, or short analytical paragraphs. The methodology also recommends the use of authentic or semi-authentic materials, teacher scaffolding, peer interaction, and formative feedback focused on both grammatical accuracy and disciplinary appropriateness (Nassaji, H. and Fotos, S. 2011. Teaching Grammar in Second Language Classrooms: Integrating Form-Focused Instruction in Communicative Context. Routledge, New York).

Table 1. Core grammar targets for biology-oriented CLIL instruction.

Academic function	Typical grammar focus	Biology-related task type
Definition and classification	Present simple; relative clauses	Classifying organisms, defining concepts
Process description	Present passive; sequencing markers	Explaining photosynthesis or cell division
Laboratory reporting	Past passive; past simple	Writing brief experiment reports
Comparison and evaluation	Comparatives; superlatives	Comparing species, habitats, or data
Hypothesis and prediction	Conditionals; modal verbs	Predicting ecological or genetic outcomes
Cause and result	Because, therefore, as a result, leads to	Explaining biological mechanisms

RESULTS AND DISCUSSION

The analysis indicates that grammar teaching becomes substantially more effective when forms are linked to the communicative logic of biology. For instance, passive constructions are not simply a grammatical topic; they are a conventional means of foregrounding process and result in scientific discourse. When students encounter the passive voice in laboratory instructions and then use it in their own reports, they understand not only how the form is built, but also why it is preferred in academic biology. A similar pattern appears in the teaching of cause-and-effect structures. Biology students frequently explain why a process occurs, what factors influence a system, or how one condition leads to another. When grammar instruction is built around these explanatory functions, structures such as because, due to, leads to, results in, and therefore acquire immediate practical value. The same is true of comparatives in taxonomy and ecology, relative clauses in definition, and conditionals in scientific prediction.

The proposed CLIL model improves grammar learning in four main ways. First, it increases relevance: students see a direct link between grammar and their field of study. Second, it improves retention: forms are repeated across reading, discussion, and writing instead of appearing in a single isolated exercise. Third, it strengthens transfer: students apply grammar in realistic academic tasks rather than only in test-like sentences. Fourth, it supports disciplinary thinking by making language part of biological reasoning rather than an external subject detached from content. For Uzbek higher education, this approach is particularly valuable because many biology students treat English as an auxiliary course and do not immediately recognize how grammar supports their professional development. CLIL changes this perception. Once grammar is presented through scientific texts, laboratory procedures, diagrams, and field-related speaking tasks, student motivation becomes more stable and participation becomes more purposeful.

At the same time, methodological improvement requires several conditions. Teachers need carefully selected materials with manageable linguistic difficulty. Grammar goals should remain visible even when content is rich. Task design should move from noticing to controlled use and then to independent production. Feedback must address both correctness and disciplinary appropriateness. Without such alignment, so-called integrated teaching may remain superficial and fail to produce measurable growth in grammatical competence. Overall, the discussion supports the view that CLIL is not merely an additional classroom technique. For biology students, it is a methodological framework that turns grammar into a working instrument of scientific communication. This is precisely what makes it valuable for higher education language instruction (Richards, J.C. and Rodgers, T.S. 2014. Approaches and Methods in Language Teaching. 3rd ed. Cambridge University Press, Cambridge).

CONCLUSION

The article has shown that the development of grammatical competence among biology students can be improved when grammar is taught through subject-relevant content rather than through isolated rule practice. A CLIL-based approach allows grammatical forms to emerge as tools for describing processes, classifying objects, reporting procedures, comparing phenomena, and formulating hypotheses. The proposed methodology integrates content-rich input, guided noticing, scaffolded practice, and productive academic output. Such sequencing helps students move from recognition to meaningful use and connects linguistic accuracy with scientific thinking. In this sense, CLIL offers not only pedagogical variety but also a stronger professional orientation for grammar teaching in higher education. The practical value of the article lies in its applicability to English for biology courses, ESP modules, and interdisciplinary language support programs in Uzbek universities. Further research may test the model empirically through classroom experimentation, pre- and post-testing, and discourse analysis of student writing and speaking.

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CONFLICT OF INTERESTS

The authors declare no conflict of interest

ETHICS APPROVAL

Not applicable

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AI TOOL DECLARATION

The authors declares that no AI and related tools are used to write the scientific content of this manuscript.

DATA AVAILABILITY

Data will be available on request

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