

ҚАЗАҚСТАН РЕСПУБЛИКАСЫ ЖОҒАРЫ БІЛІМ ЖӘНЕ ҒЫЛЫМ МИНИСТРЛІГІ
ҚЕАҚ «Л. Н. Гумилев атындағы Еуразиялық ұлттық университеті»
Филология факультеті
Шетел тілдері кафедрасы



**II Spring International Scientific and Practical ONLINE
Conference “Innovative Approaches of Language Teaching:
Bridging Theory and Practice”**

**«Тілдерді оқытудың инновациялық тәсілдері: теория мен
практиканы ұштастыру» атты II көктемгі халықаралық
ғылыми-практикалық конференция**

**II весенняя международная научно-практическая
конференция «Инновационные подходы преподавания
языков: слияние теории и практики»**

PROCEEDINGS

Astana, Kazakhstan

April 4, 2026

УДК 80/81
ББК 81.2

Жалпы редакциясын басқарған: Дүйсенғазы С. М.
Редакция алқасы: Балхимбекова П.Ж., Тусупбекова М.Ж., Кызырова А.М.

Тілдерді оқытудың инновациялық тәсілдері: теория мен практиканы ұштастыру:
халықаралық ғылыми-практикалық конференция материалдары. 4 сәуір 2026 ж./ – Астана:
Л.Н. Гумилев атындағы ЕҰУ, 2026. – 454 бет.

ISBN 978-601-385-215-7

«Тілдерді оқытудың инновациялық тәсілдері: теория мен практиканы ұштастыру» атты ІІ көктемгі халықаралық ғылыми-практикалық конференция материалдар жинағында шетел тілдерін оқыту саласындағы озық тәжірибелермен алмасуға, мәдениетаралық қарым-қатынасты нығайтуға, цифрлық дәуір жағдайында шетел тілдерін оқытудағы инновациялық технологияларды таратуға, сондай-ақ халықаралық ғылыми-академиялық ынтымақтастықты кеңейтуге бағытталған ғылыми-практикалық зерттеулердің нәтижелері енгізілген. Материалдарда білім алушылар мен жас ғалымдардың осы бағыттағы зерттеулерге белсенді қатысуын ынталандыру мәселелері қарастырылған.

В сборник материалов ІІ весенней международной научно-практической конференции «Инновационные подходы преподавания языков: слияние теории и практики» включены результаты научно-практических исследований, направленных на обмен передовым опытом в области преподавания иностранных языков, укрепление межкультурной коммуникации, распространение инновационных технологий обучения в условиях цифровой эпохи, а также расширение международного научно-академического сотрудничества. В материалах рассматриваются вопросы стимулирования активного участия обучающихся и молодых ученых в исследованиях в данной области.

The proceedings of the ІІ Spring International Scientific and Practical ONLINE Conference “Innovative Approaches of Language Teaching: Bridging Theory and Practice” include the results of scientific and practical research aimed at sharing advanced experience in foreign language teaching, strengthening intercultural communication, disseminating innovative teaching technologies in the digital age, and expanding international scientific and academic cooperation. The materials also address issues related to encouraging the active participation of students and young researchers in this field.

УДК 80/81
ББК 81.2

ISBN 978-601-385-215-7

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II Spring International Scientific and Practical ONLINE Conference “Innovative Approaches of Language Teaching: Bridging Theory and Practice”

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теории и практики»**

The Main Themes of the Conference:

1. Teaching foreign languages for professional and interdisciplinary purposes.
2. Innovative technologies in foreign language teaching methodology.
3. Language training in the context of multilingualism and lifelong learning.
4. Language education based on digital technologies and artificial intelligence.

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в условиях межкультурной коммуникации. В целом, интеграция аутентичных текстов и реалий повседневной жизни в процесс обучения иностранному языку отвечает современным требованиям образовательной парадигмы, ориентированной на подготовку специалистов, способных к успешному профессиональному и социальному взаимодействию в глобальном межкультурном пространстве.

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IRSTI 14.25.09

CLIL AS AN INTERDISCIPLINARY APPROACH: LEARNING BIOLOGY THROUGH ENGLISH

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Abstract

Content and Language Integrated Learning (CLIL) is widely used in multilingual educational environments as a method that combines subject instruction with foreign language use. In CLIL classrooms, academic content is taught through a second language, allowing learners to develop disciplinary knowledge and language competence simultaneously and this study aims to investigate how CLIL principles are

implemented in biology instruction in NIS classrooms.

However, given article examines the application of CLIL in biology classes taught in English, the research focuses on classroom practices implemented in Nazarbayev Intellectual Schools (NIS) in Kazakhstan, where several science subjects are taught through English. The paper analyzes the theoretical principles of CLIL and describes teaching strategies used to integrate biological content with language development. Particular attention is given to the acquisition of subject-specific vocabulary and the use of English for explaining biological processes and scientific concepts.

The study is based on a review of CLIL-related literature and classroom observations conducted in biology lessons delivered in English in NIS schools. The analysis focuses on how instructional practices support students' comprehension of biological concepts and their ability to communicate scientific knowledge in English.

The results indicate that integrating biology instruction with English-medium communication helps students expand their scientific vocabulary and participate more actively in classroom discussions. At the same time, differences in language proficiency may influence students' comprehension of complex scientific explanations. For this reason, effective CLIL instruction requires structured linguistic support and carefully designed learning tasks.

The findings suggest that CLIL can support interdisciplinary learning in biology education when language scaffolding and subject-focused instruction are carefully balanced.

Keywords: CLIL, interdisciplinary learning, biology education, English-medium instruction, Nazarbayev Intellectual Schools

Introduction

In many education systems, English is used as a language of instruction for science and technology subjects. This practice reflects the role of English as the dominant language of international research, academic publications and global scientific communication[1]. As a result, schools and universities increasingly introduce teaching models that combine subject learning with the use of English as a medium of instruction.

One approach that addresses this goal is Content and Language Integrated Learning (CLIL)[2]. In this model, a foreign language is used to teach academic subjects while students simultaneously develop language competence and subject knowledge. Rather than studying language and content separately, learners use the target language to understand and explain disciplinary concepts.

CLIL has been widely implemented in European educational systems since the 1990s and has gradually expanded to other regions. In Kazakhstan, similar practices are applied in specialized schools such as Nazarbayev Intellectual Schools (NIS), where several science subjects are taught in English as part of a trilingual education policy. In this context, CLIL-based instruction provides students with opportunities to

engage with scientific content while developing the language skills required for international academic communication.

Biology represents a suitable subject for this approach because many biological concepts can be supported through visual materials, diagrams, and laboratory activities. These instructional tools help students interpret complex scientific processes while interacting with subject-specific terminology in English.

The present study examines the use of CLIL as an interdisciplinary approach in teaching biology through English. The research focuses on instructional practices observed in biology lessons in Nazarbayev Intellectual Schools in Kazakhstan. Particular attention is given to how teaching strategies support students' understanding of biological concepts and their ability to explain scientific processes in English.

Literature Review

Research on bilingual and multilingual education increasingly examines how subject content and language instruction can be integrated within the same learning environment. One of the most widely discussed approaches in this area is Content and Language Integrated Learning (CLIL), in which academic subjects are taught through a foreign language while learners simultaneously develop disciplinary knowledge and language competence. According to Coyle, Hood, and Marsh (2010), CLIL shifts the role of language from an isolated object of study to a medium for constructing subject knowledge.

The pedagogical framework most frequently associated with CLIL is the 4Cs[3] model proposed by Coyle. This framework identifies four interconnected dimensions that guide instructional design: Content, Communication, Cognition, and Culture. Content refers to the academic knowledge students acquire, while communication focuses on the use of language to explain and discuss subject-related ideas. Cognition involves the development of analytical thinking and problem-solving skills, and culture reflects the intercultural dimension of learning. Within CLIL classrooms, these components interact to support both conceptual understanding and language development.

A number of studies have examined how CLIL influences students' engagement with subject learning. Research conducted in European CLIL programs reports that students often demonstrate improved receptive language skills and greater familiarity with academic vocabulary when subject content is taught through a foreign language[4]. These outcomes are particularly evident in science education, where learners regularly encounter specialized terminology and structured explanations.

Science subjects are frequently considered suitable for CLIL because their concepts can be supported through visual representations, diagrams, models, and experimental activities. These resources help students interpret complex processes while interacting with scientific terminology in the target language. As a result, CLIL instruction in science classrooms often combines conceptual explanation with guided language use.

In addition to classroom practices, several studies emphasize the importance of instructional materials and textbooks in CLIL implementation. Teaching materials designed for CLIL environments typically combine subject explanations with structured language support, including glossaries, visual diagrams, guiding questions, and tasks that encourage students to use academic vocabulary. The design of such materials plays a key role in helping learners interpret subject content while developing the language needed to discuss disciplinary concepts.

In Kazakhstan, similar approaches are implemented in Nazarbayev Intellectual Schools (NIS), where science subjects are partly delivered in English as part of a trilingual education policy. Biology instruction in these schools is supported by English-medium textbooks and learning materials developed for CLIL-based teaching. These materials aim to integrate biological content with academic English, enabling students to engage with scientific concepts while simultaneously expanding subject-specific vocabulary.

Recent studies examining NIS educational practices highlight the role of textbooks and structured learning materials in supporting bilingual science instruction. Analyses of NIS instructional resources indicate that these materials often incorporate visual explanations, structured tasks, and terminology lists designed to assist students in understanding complex scientific concepts in English. Such features are intended to reduce language barriers while maintaining the academic depth of subject content.

However, the effectiveness of CLIL-based textbooks and learning materials depends on how they are used in classroom practice. Researchers note that even well-designed materials require appropriate instructional strategies, including teacher guidance, interactive tasks, and opportunities for students to explain scientific concepts using academic language.

Building on these perspectives, the present study focuses on the analysis of biology lessons and instructional materials used in Nazarbayev Intellectual Schools in Kazakhstan. Particular attention is given to how biology textbooks and classroom activities support the integration of subject learning and English-medium communication within CLIL-based instruction.

Methods

This study employs a qualitative research design to examine how CLIL principles are reflected in biology instruction and teaching materials used in Nazarbayev Intellectual Schools (NIS) in Kazakhstan. The research focuses on two main aspects: the analysis of biology textbooks used in English-medium instruction and the observation of classroom practices in which these materials are applied.

First, a document analysis of biology textbooks and instructional materials used in NIS schools was conducted. The analysis examined how biological concepts are presented in English and how language support is integrated into the learning materials. Particular attention was given to the presence of subject-specific terminology, visual representations such as diagrams and illustrations, glossary sections, and learning tasks

that encourage students to use English when explaining biological processes.

Second, classroom observations were carried out during biology lessons taught in English. These observations focused on how teachers and students interact with the textbooks and learning materials during instruction. The analysis considered how teachers explain biological concepts, how students use English to describe scientific ideas, and how visual and textual resources support comprehension.

The collected data were analyzed using qualitative content analysis. The analysis aimed to identify patterns in the presentation of biological knowledge and the integration of language support within instructional materials and classroom activities. Particular attention was given to how CLIL principles—such as the integration of content learning and language development—are reflected in both teaching resources and classroom interaction.

By combining textbook analysis with classroom observation, the study provides insight into how CLIL-based biology instruction functions in practice within the NIS educational context.

CLIL and the 4Cs Framework

The analysis of instructional materials and classroom practices in Nazarbayev Intellectual Schools was conducted with reference to the 4Cs framework, which is widely used to describe the pedagogical structure of CLIL instruction[5]. This framework includes four interconnected dimensions: Content, Communication, Cognition, and Culture. These elements provide a useful model for examining how subject knowledge and language learning are integrated in educational materials and classroom interaction.

The Content dimension refers to the presentation of disciplinary knowledge. In the analyzed biology textbooks, biological concepts such as cell structure, photosynthesis, and ecological systems are introduced through structured explanations supported by diagrams and visual representations. These materials present subject knowledge in English while maintaining the scientific accuracy required for biology instruction.

The Communication component relates to how language is used for learning and explaining subject concepts. The examined textbooks include questions and tasks that encourage students to describe biological processes, interpret diagrams, and explain relationships between biological structures. These tasks require learners to actively use English when discussing scientific ideas.

The Cognition dimension focuses on the development of analytical and problem-solving skills. In the analyzed materials, students are often asked to compare biological processes, interpret visual information, and explain cause-and-effect relationships within ecosystems or cellular systems. Such tasks require learners to engage with biological concepts while using English as a tool for reasoning and explanation.

The Culture dimension reflects the broader context of scientific knowledge and global communication. By studying biology through English, students interact with terminology commonly used in international scientific discourse. This exposure helps

prepare learners for participation in global academic environments where English functions as the primary language of scientific communication.

Applying the 4Cs framework to the analysis of NIS biology textbooks allows a clearer understanding of how CLIL principles are reflected in instructional materials and classroom practice. This analytical framework also provides the basis for interpreting the results presented in the following section.

Example of a CLIL Biology Lesson

An example of CLIL-based instruction can be observed in biology lessons that focus on the topic of photosynthesis. This topic appears in the analyzed NIS biology textbooks and provides opportunities to integrate biological concepts with academic English.

At the beginning of the lesson, teachers typically introduce the key concept using visual materials from the textbook, including diagrams of plant cells and schematic representations of the photosynthesis process. These visual resources illustrate how sunlight, water, and carbon dioxide interact to produce glucose and oxygen. The use of diagrams helps students interpret the scientific process while interacting with English terminology.

Following the introduction, teachers draw students' attention to key biological terms such as chlorophyll, carbon dioxide, glucose, and oxygen. These terms are presented within the context of the biological explanation rather than as isolated vocabulary items. Students are encouraged to read short sections of the textbook and identify how these terms are used to describe the process of photosynthesis.

The next stage of the lesson involves guided discussion and collaborative tasks. Students work in pairs or small groups to analyze diagrams and explain the sequence of events in the photosynthesis process. During this activity, learners use English to describe biological mechanisms and interpret visual information from the textbook.

Teachers often support comprehension by asking structured questions, for example:

What kind of are required for photosynthesis?

Where in the plant cell does this process occur?

What products are formed during photosynthesis?

These questions encourage students to combine subject knowledge with language use while explaining biological processes.

In the final stage of the lesson, students may be asked to summarize the process of photosynthesis using the terminology introduced earlier. This activity reinforces both conceptual understanding and academic language use. The example demonstrates how CLIL-based biology instruction integrates visual materials, subject terminology, and structured communication tasks to support learning in English.

Results

The analysis of biology textbooks and classroom practices in Nazarbayev Intellectual Schools revealed several features that reflect the principles of CLIL-based

instruction.

First, the examined biology textbooks present scientific concepts through a combination of visual and textual explanations. Diagrams, labeled illustrations, and schematic representations are frequently used to explain biological structures and processes such as cell organization, photosynthesis, and ecological interactions. These visual elements support students' comprehension of subject content while reducing the linguistic complexity of explanations presented in English.

Second, the textbooks incorporate subject-specific terminology together with contextual explanations. Key biological terms are often introduced within the main text and supported by definitions or glossary sections. This structure allows students to encounter scientific vocabulary in meaningful contexts rather than as isolated word lists.

Another important feature identified in the materials is the presence of guided learning tasks that require students to use English when describing biological concepts. These tasks include questions that prompt learners to explain processes, interpret diagrams, or compare biological systems. Such activities encourage students to apply newly acquired vocabulary while discussing scientific ideas.

Classroom observations demonstrated that teachers actively use these materials to support comprehension. During lessons, teachers frequently refer to textbook diagrams and ask students to describe biological processes using English terminology. In several observed lessons, students worked in pairs or small groups to interpret visual materials and explain biological mechanisms.

At the same time, the observations also revealed challenges related to language proficiency. Some students experienced difficulty explaining complex biological concepts in English, particularly when discussing abstract processes. In these situations, teachers provided additional support through simplified explanations, repeated terminology, and visual references.

Overall, the results suggest that NIS biology textbooks and instructional practices incorporate several elements consistent with CLIL methodology, including visual scaffolding, contextualized terminology, and interactive learning tasks that encourage the use of English in subject-related communication.

Discussion

The results of this study demonstrate that the use of CLIL principles in NIS biology instruction is reflected both in the structure of instructional materials and in classroom practices. The analyzed textbooks combine conceptual explanations, visual representations, and subject-specific terminology, which supports students' understanding of biological processes while interacting with English as the language of instruction.

These findings correspond with previous research on CLIL implementation in science education. Studies on CLIL classrooms have shown that the integration of visual materials, structured tasks, and subject terminology helps learners interpret

complex disciplinary concepts while developing academic language skills. In the observed NIS lessons, diagrams, labeled illustrations, and guided questions played a similar role in facilitating comprehension of biological content.

The analysis also indicates that textbooks function as an important mediating tool between language and subject learning. The examined NIS materials introduce biological terminology within explanatory contexts rather than as isolated vocabulary lists. This approach encourages students to interpret scientific concepts through language use, which aligns with the CLIL principle that language should serve as a medium for constructing knowledge[6].

Classroom observations further show that teachers actively use these materials to guide students' explanations of biological processes. By referring to textbook diagrams and prompting students to describe mechanisms such as photosynthesis, teachers create opportunities for learners to practice scientific communication in English. These interactions demonstrate how classroom discourse[7] supports the integration of subject learning and language development.

At the same time, the study identifies several challenges related to CLIL-based biology instruction. Differences in students' English proficiency may limit their ability to express complex scientific explanations. In the observed lessons, teachers often addressed this issue by repeating key terminology, simplifying explanations, and directing students' attention to visual materials. These strategies reflect common scaffolding practices used in CLIL classrooms.

Overall, the findings suggest that CLIL-based biology instruction in NIS schools supports interdisciplinary learning by combining subject knowledge with English-medium communication. However, the effectiveness of this approach depends not only on the design of textbooks but also on how teachers guide students in interpreting scientific content and using academic language during classroom interaction.

Conclusion

This study examined the implementation of CLIL principles in biology instruction in Nazarbayev Intellectual Schools in Kazakhstan, with particular attention to the role of English-medium textbooks and classroom practices. The analysis of instructional materials and lesson observations demonstrated that CLIL-based teaching integrates subject knowledge with language use through visual representations, contextualized terminology, and structured learning tasks.

The findings indicate that NIS biology textbooks support the integration of biological concepts and academic English by presenting scientific explanations alongside diagrams, glossary elements, and guided questions. These materials help students interpret complex biological processes while interacting with subject-specific terminology in English. Classroom observations further show that teachers actively use these resources to encourage students to explain scientific ideas, interpret diagrams, and discuss biological mechanisms during lessons.

At the same time, the study identified challenges related to differences in

students’ English proficiency. Some learners experienced difficulty expressing complex biological explanations in English, which required additional support from teachers through repetition, clarification, and visual references. These practices highlight the importance of scaffolding strategies in CLIL-based science instruction.

Overall, the results suggest that the integration of biology content and English-medium instruction in NIS schools creates conditions for interdisciplinary learning, where students simultaneously develop conceptual understanding and academic language skills. Future research could further examine how CLIL-based instructional materials influence students’ scientific reasoning and long-term development of academic English in science education.

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16.21.27

РОЛЬ АНГЛИЙСКОГО ЯЗЫКА В СФЕРЕ ГОСТЕПРИИМСТВА

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