

17. Tsaparlis, G., & Sevian, H. (2017). Professional Development of Chemistry Teachers. In J. K. Gilbert (Ed.), *Advances in Chemistry Education* (Vol. 3, pp. 179-204). Springer.
18. Wang, H., & Chen, L. (2019). Content Knowledge and Conceptual Understanding in Chemistry Teaching. *International Journal of Science Education*, 8(1), 45-58.

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USING OF THE CLIL METHOD IN THE CLASSES OF CHEMISTRY

Abstract. A review of the literature in this system is aimed at using the CLIL method in Chemistry Lessons. The review analyzes and summarizes the research papers of various sources and examines the benefits and needs of using the CLIL method in Chemistry Lessons. By providing students with valuable insight into effective learning strategies through the CLIL method, it is a comprehensive review that paves the way for the formation of both content knowledge and high-level cognitive abilities of students.

Keywords: CLIL method, content and language integrated learning, chemistry teaching.

Introduction

Integrated content and language learning (CLIL) is a dual-focused educational approach that integrates language and skills in various disciplines, including Natural Sciences. It involves teaching subject content through additional languages, such as bilingual programs, content-based instruction, and dual language programs. [5]

CLIL in chemistry is ideal for achieving scientific literacy. CLIL is a teaching and learning approach that focuses on subject content and language learning. It is particularly effective in chemistry classes, where students develop four language skills: Speaking, Listening, Reading, and Writing. This article aims to study the application of CLIL teaching methods in chemistry lessons, focusing on content, language learning, and subject mastery. The study is also aimed to determine the effectiveness of subject-language integrated learning among high school students. [9]

Literature review

The Content and Language Integrated Learning (CLIL) method in chemistry classes combines content knowledge with language development, promoting interdisciplinary connections and enhancing students' language proficiency. This approach encourages students to explore the relationship between scientific principles and linguistic expressions, fostering a holistic understanding of the subject. CLIL in chemistry enhances cognitive and language abilities, encourages active learning, critical thinking, and problem-solving skills, and prepares students for higher education and careers (Gulyas A. et al. – 2015).

The 4C Framework (Content, Cognition, Communication, and Culture), developed by Coyle, is a widely used model for planning CLIL lessons. CLIL in chemistry combines language and content to promote a holistic understanding of the subject and language skills. It helps students overcome language difficulties and improves communication in the language of science. Lessons focus on intercultural

knowledge, communication skills, and multilingual interests, bridging existing curricular and disciplinary boundaries. They build intercultural knowledge, develop intercultural communication skills, and increase learners' motivation and confidence in both language and subject.

Students develop a deeper understanding of chemistry concepts through meaningful language activities, enhancing their ability to ask, research, and solve problems using both scientific methods and language tools. This holistic approach prepares students for a competitive global job market and opens the way to obtaining knowledge abroad and mastering scientific books and materials about world chemistry (Coyle, 2015).

CLIL also addresses societal challenges by providing students with the knowledge and skills to solve real-world public problems through a scientific lens. By combining the development of languages with knowledge of chemistry, students learn to effectively convey scientific solutions to social problems. CLIL learned through hands-on activities in chemistry and physics classes, focusing on how subject-specific language can be learned through hands-on activities (Nikula T. – 2015).

The main goals of utilizing ITC resources to inspire and include pupils in science investigations and communication in various languages and introducing CLIL in chemistry education include increasing language proficiency, deepening understanding of chemistry concepts, developing critical thinking skills, increasing intercultural awareness, preparing students for higher education and careers, and improving communication skills (Clotilde B. M., Andrea C. – 2016).

The purpose of this study is to analyze the existing method of introducing content and language Integrated Learning (CLIL) in Chemistry Lessons, as a result of using methods in the lesson and to identify methods in which education level.

Methodology

A comprehensive review of about 20 academic articles on the application of the CLIL approach to teaching chemistry was carried out, 10 of which were analyzed, and special attention was paid to aspects of the structure of CLIL teaching methods in Chemistry Lessons. Working with keywords such as "CLIL method", "content and language integrated learning", "chemistry teaching" made it possible to identify relevant research and articles for inclusion in the analysis. The study of articles and their comparison made it possible to identify the main components and principles of approaches to CLIL teaching methods used in the context of teaching chemistry.

Sampling

To achieve the goal, we reviewed 10 scientific works, including scientific journals, articles, methodological books.

Article name (author, year of publication)	Description
Bianco L., Andonova I.– 2020.	Correlation between students' prior exposure to the foreign language and their level of skill

Garcia Tapias S. – 2016.	To enhance English proficiency in Catalan chemistry classrooms.
Nikula T. – 2015.	Language problems and the need for CLIL teachers to understand their role in language education.
Gulyas A. et al. – 2015.	Explored the CLIL model, which combines language and science teaching, specifically in chemistry units, demonstrating its effectiveness in achieving scientific literacy.
Hoang T. H., Ha M. N. – 2019.	Potential for combining science knowledge and English, despite students' lack of English language skills.
Paviscic C. I. – 2011.	To create an English-language Chemistry course to enhancing students' cognitive abilities, intercultural awareness, and motivation, bridging curricular and disciplinary divides.
Clotilde B. M., Andrea C. – 2016.	To enhance students' scientific practice and foreign language communication, utilizing ITC tools.
Nurdillayeva R. N., Zhuman G. – 2021.	Online teaching of Inorganic Chemistry in English, revealing increased student interest and improved learning outcomes.
Schietroma E. – 2019.	The CLIL method cooperative approaches, student centrality, ICT, and laboratory tasks to teach chemistry, fostering integration, critical European competences, and motivation, despite language and conceptual backgrounds.
Nawrot-Lis B. – 2019.	CLIL chemistry course, emphasizing the value of CLIL efforts in dialect education, motivating remote teachers, and enhancing understanding.

Data collection

During the research work, I searched Google Scholar for articles related to " **Application of CLIL teaching methods in chemistry lessons** ", especially focusing on the keyword "CLIL method, content, and comprehensive language learning, chemistry teaching". I researched various academic databases to find relevant literature and critically assessed the suitability of each article to address research objectives. This process helped to ensure that only relevant and high-quality articles were included in the analysis, which contributed to a comprehensive understanding of the use of the CLIL method in Chemistry Lessons.

Data analysis

According to the studies were carried out. The first study was aimed at using the CLIL method in Chemistry Lessons. And the methods used in scientific works were divided into 7 categories.

Result

Based on the results of a comprehensive analysis of data, it includes various approaches to teaching using the CLIL method in Chemistry Lessons. In addition, most studies have concluded that using the CLIL method provides opportunities for students and helps improve students' abilities. I noticed that the CLIL method is used not only in secondary and higher education schools, but also in universities. The vast majority of articles used these 7 research methods. The practical parts of these works were about 50% of high school students, 30% of university students, and 20% of secondary school students.

Every item we looked at made the assertion that using the CLIL technique will raise the standard of chemistry education. 30% of the effort focused on the potential and outcomes of using the CLIL method to teach chemistry, 40% examined CLIL teaching methods, and 30% developed the CLIL method Unit plan and model.



Conclusion

In conclusion, using the CLIL method in Chemistry Lessons understanding the language of chemistry is very important for effective communication between scientists, researchers and students in this field. This allows the exchange of specific and specific information related to the study of matter and its transformations. Using the CLIL methodology, I made sure that creating a CLIL lesson plan in chemistry using other methods helps to increase students' motivation, develop students' second or foreign language, cognitive abilities, and intercultural understanding.

References

1. Bianco L., Andonova I. Content and Language Integrated Learning applied to teaching chemistry: A case study from Eastern Europe. – 2020.
2. Clotilde B. M., Andrea C. CLIL & IBSE methodologies in a chemistry learning unit //European Journal of Research and Reflection in Educational Sciences Vol. – 2016. – T. 4. – №. 8.
- Nurdillayeva R. N., Zhuman G. O. Application of the CLIL Method in the Classes of Inorganic Chemistry //Bull. Karaganda Univ. "Chem." Ser. – 2021. – T. 102. – C. 96-104.

3. Coyle D. Strengthening integrated learning: Towards a new era for pluriliteracies and intercultural learning //Latin American Journal of Content & Language Integrated Learning. – 2015. – Т. 8. – №. 2. – С. 84-103.
4. Garcia Tapias S. Effectiveness of the implementation of CLIL resources in the chemistry classroom. – 2016.
5. Gulyas A. et al. A model for CLIL in school chemistry classes: Combining the aims of CLIL and chemistry teaching //International Journal of Physics and Chemistry Education. – 2015. – Т. 7. – №. 2. – С. 75-82
6. Hoang T. H., Ha M. N. Applying Content and Language Integrated Learning Approach in Designing Chemistry Lesson Plan for High School Students //VNU Journal of Science: Education Research. – 2019. – Т. 35. – №. 3.
7. Nawrot-Lis B. The challenges of content acquisition in a CLIL course: A CLIL-based chemistry course at the lower secondary school level. – Springer Nature, 2019.
8. Nikula T. Hands-on tasks in CLIL science classrooms as sites for subject-specific language use and learning //System. – 2015. – Т. 54. – С. 14-27.
9. Omarbekova G. Content and Language Integrated Learning (CLIL) as an effective approach for teaching Kazakh language at the University level. – 2023.
10. Pavisic C. I. CLIL Teaching: an Opportunity to Teach Chemistry //ICT for Language Learning, 4th Pixel Conference Proceedings, Milan. – 2011.
11. Schietroma E. Innovative STEM lessons, CLIL and ICT in multicultural classes //Journal of e-Learning and Knowledge Society. – 2019. – Т. 15. – №. 1.

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ВНЕДРЕНИЕ STEM-ОБРАЗОВАНИЯ В ОБУЧЕНИЕ ФИЗИКИ ДЛЯ УЧАЩИХСЯ 7-8 КЛАССОВ С ПРИМЕНЕНИЕМ МЕТОДОВ 5E, PBL И ИНЖЕНЕРНОГО ДИЗАЙНА

Аннотация. STEM-образование представляет собой междисциплинарный подход, который интегрирует науку, технологию, инженерное дело и математику в учебные программы. В данной статье рассматривается внедрение STEM-образования в обучение физики с использованием методов 5E, проблемно-ориентированного обучения (PBL) и инженерного дизайна. Исследование показывает, что эти методы способствуют более глубокому пониманию физических понятий, развитию навыков решения проблем и критического мышления, а также повышению интереса к предмету.

Цель исследования: заключается в оценке эффективности внедрения STEM-образования в процесс обучения физики с использованием методов 5E, проблемно-ориентированного обучения (PBL) и инженерного дизайна. **Методология исследования** основана на анализе результатов образовательных практик, в которых применялись упомянутые методы. Были проведены уроки с использованием методов 5E и PBL, а также выполнены проекты по