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Integration of web applications into content and language integrated learning (CLIL) programmes in higher education: Ukrainian context

La integración de aplicaciones web en programas de aprendizaje integrado de contenido y lengua (CLIL) en la educación superior: contexto ucraniano

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Abstract

The study analyses the impact of web-based applications on the effectiveness of content and language-integrated learning (CLIL) in higher education in the context of globalisation and the growing role of multilingualism in the European Union.

The study aimed to determine the impact of web-based applications on developing students' language competencies and their involvement in the learning process in CLIL. To achieve this goal, a systematic review of the scientific literature published in leading scientific databases from 2019 to 2024 was conducted. The study's results demonstrate that integrating web-based applications into the CLIL teaching process has a positive impact on students' language skills development and increases their motivation to learn. However, successfully implementing web technologies requires special training and adaptation to the learning environment.
The study's findings emphasise the importance of further studying web applications' potential in the context of CLIL and developing effective strategies for integrating them into the educational process.

Keywords: development of language and subject competence, digital learning environment, CLIL programmes in higher education, motivation enhancement.

Resumen

El estudio analiza el impacto de las aplicaciones basadas en la web en la eficacia del aprendizaje integrado de contenidos e idiomas (AICLE) en la enseñanza superior en el contexto de la globalización y el creciente papel del multilingüismo en la Unión Europea.
El estudio pretendía determinar el impacto de las aplicaciones basadas en la web en el desarrollo de las competencias lingüísticas de los estudiantes y su implicación en el proceso de aprendizaje en AICLE. Para lograr este objetivo, se realizó una revisión sistemática de la literatura científica publicada en las principales bases de datos científicas de 2019 a 2024.
Los resultados del estudio demuestran que la integración de aplicaciones basadas en la web en el proceso de enseñanza AICLE tiene un impacto positivo en el desarrollo de las competencias lingüísticas de los estudiantes y aumenta su motivación para aprender. Sin embargo, aplicar con éxito las tecnologías web requiere una formación especial y una adaptación al entorno de aprendizaje.
Las conclusiones del estudio subrayan la importancia de seguir estudiando el potencial de las aplicaciones web en el contexto del AICLE y de desarrollar estrategias eficaces para integrarlas en el proceso educativo.

Palabras clave: desarrollo de competencias lingüísticas y temáticas, entorno digital de aprendizaje, programas AICLE en la enseñanza superior, aumento de la motivación.

Introduction

In recent years, the CLIL (Content and Language Integrated Learning) method has become widespread in higher education, particularly in the context of globalisation and integrating foreign language teaching with academic disciplines.

CLIL involves the simultaneous teaching of subject content and a foreign language, which creates unique opportunities for developing students' language skills in real-life contexts of academic disciplines (Hubal, 2023). This approach promotes deeper learning of the academic material and improves students' communication skills, preparing them for intercultural interaction in a globalised society. Learning a language through subject content allows students to gain knowledge in specific areas, which increases their motivation and engagement in the learning process (Yuhan, 2017).

However, the successful implementation of CLIL in higher education requires detailed research on its effectiveness, requirements for teacher training and curriculum adaptation. This article discusses educational institutions' main advantages and challenges when implementing the CLIL method. It analyses its impact on the training of highly qualified specialists in the modern educational environment. Content and language-integrated learning (CLIL) is an innovative pedagogical approach that combines the development of language skills with the acquisition of content in specific disciplines. This approach significantly increases the level of intercultural communication, students' cognitive abilities and knowledge of specific norms and rules related to the language and subject area (Jiménez-Benavides, 2023).

Integrating web applications into CLIL can significantly enhance this approach in higher education. Using online resources creates an opportunity to develop interactive learning materials that engage students and promote their active participation. Thanks to digital platforms, teachers can offer a variety of learning modalities, including videos, interactive exercises, and online discussions, which increase students' interest and motivation to learn.

Historically, CLIL emerged in the 1990s as an initiative to promote bilingual education in Europe (Paran, 2013). Since then, the approach has gained widespread acceptance, expanding its scope to higher education and beyond the European context. Current research confirms that CLIL promotes language skills and improves students' academic, cultural and cognitive abilities (Tinedo Rodríguez, 2022).

Web-based applications can be important tools to support CLIL learning objectives. They allow teachers to adapt learning materials to meet students' needs, stimulating critical thinking and flexibility in learning (Merchán Cedillo & Mora Aguilar, 2024). For example, collaboration and information-sharing platforms can facilitate intercultural exchange and the development of communication skills.

In Europe and elsewhere, bilingual education began to develop in the 1970s, focusing on learning a second or minority language. For example, in France, such programmes allowed children from linguistic minorities to study in their mother tongue (Adam, 2019). These initiatives have been seen to enrich the educational process, mainly to protect minority languages (Cortier & Puren, 2008). It is important to note that the second language is complemented, not replaced, with the mother tongue. Thus, in this context, the European Commission called for implementing national action plans for early language acquisition (Holdsworth, 2003). In some countries, the emphasis is on introducing modern languages in the early stages of education. Numerous European initiatives have encouraged educational institutions to integrate CLIL into their curricula. In contrast to immersive programmes that strive for perfect bilingualism (Petit, 2020), the CLIL approach emphasises teaching some subjects in a foreign language, while the teacher can use the mother tongue if necessary. CLIL promotes dual learning, where subjects are taught alongside the foreign language, allowing the language to be used as a learning tool (Martens et al., 2023).

The integration of innovative web technologies within CLIL programmes aligns with findings by Leleka et al. (2024), who emphasize the importance of web-oriented approaches in health-preserving education, highlighting their efficacy in fostering engagement and practical application. This approach creates opportunities for integrating web-based applications into learning, allowing students to practice the language in authentic situations and contexts. Thus, CLIL becomes a platform for effective language skills development, stimulating interdisciplinary and more profound learning (Herrera, 2024). Thus, integrating web-based applications into CLIL programmes in higher education opens up new opportunities for creating an inclusive and dynamic learning environment that prepares students for the challenges of the globalised world.

A significant amount of research has confirmed the effectiveness of the CLIL method in higher education. However, research gaps still exist:

There is a lack of data demonstrating the specific impact of web application integration on the success of the CLIL approach in higher education.

There is a lack of generalisations from the practical experience of using web-based applications by cadets trained under grant programmes or in specific disciplines.

The system of assessment of learning outcomes using CLIL and interactive technologies has not yet developed standards that would be accepted internationally.

Research problem

The study's relevance is due to the growing interest in multilingualism and innovative teaching methods in higher education. CLIL, as a methodology that combines the study of a subject area and a foreign language, has significant potential for developing students' language competencies and improving the quality of the educational process.

The CLIL (Content and Language Integrated Learning) method requires a detailed study of its effectiveness and possible challenges associated with its implementation in higher education. Research should focus on how CLIL affects the development of students' language skills, academic performance, and intercultural communication, as well as teacher training and the adaptation of curricula to the needs of the modern learning environment. It is also essential to find out how integrating web-based applications can improve this approach by providing more opportunities for active learning.

The subject of the study is content and language-integrated learning (CLIL) as an innovative teaching methodology in higher education. The research is a comprehensive analysis of the effectiveness of CLIL, identifying its strengths and weaknesses and determining the factors that influence the success of the implementation of this methodology. In particular, the study focuses on such aspects as the impact of CLIL on the development of students' language competencies and academic performance, preparation of teachers to work in CLIL, adaptation of curricula and the use of digital technologies in the learning process.

Research Focus

This study focuses on teacher professional development and the skills required for the successful implementation of CLIL (Content and Language Integrated Learning). A key aspect is adapting curricula in accordance with CLIL principles, which allows for the integration of content training with the development of language competencies.

The study also looks at how curricula can be transformed to integrate disciplinary content and foreign language learning effectively. This includes developing innovative methodologies and teaching materials that contribute to the development of student's language skills, which are important for their success in a globalised society. Particular attention is paid to the role of digital technologies and web applications in enhancing the effectiveness of the CLIL learning process. Digital resources and tools provide interactivity and personalised learning, which contributes to increased student engagement and effective achievement of learning objectives.

It assesses how web-based applications facilitate interaction between students and teachers, creating a dynamic learning environment that increases learning motivation and improves learning. The final section of the study focuses on analysing the challenges associated with integrating CLIL into the educational process. The main difficulties are technical problems, cultural and linguistic barriers, limited resources and methodological approaches. Based on the review of scientific sources, strategies are proposed to overcome these challenges and increase the effectiveness of CLIL implementation in the higher education system. This study focuses on the professional development of teachers and the skills required for the successful implementation of CLIL (Content and Language Integrated Learning). A key aspect is the adaptation of curricula by CLIL principles, which allows for integrating content training with the development of language competencies.

Research Aim

The purpose of the article is to analyse the potential and challenges of applying the CLIL (Content and Language Integrated Learning) methodology in the Ukrainian higher education system and explore the possibilities of adapting this approach to local conditions. Modern technologies and web-based applications can radically change the learning process in the context of CLIL, contributing to deeper learning, increasing students' motivation and developing skills that meet the requirements of the globalised world. Technology

integration makes the learning process more interactive, individualised and flexible, which is especially important in CLIL programmes where students simultaneously master a subject and learn a foreign language.

This study examines the introduction of CLIL in the Ukrainian higher education system. It aims to highlight the critical aspects of its integration into the curriculum and assess its impact on the quality of education. CLIL, as an innovative approach, combines the study of subject content and foreign language acquisition, which allows students to develop academic and linguistic competences simultaneously. However, the introduction of CLIL in Ukrainian higher education institutions is accompanied by numerous challenges, including problems with curricula and teacher training.

A comparative analysis of teaching effectiveness using CLIL and traditional methods is planned to achieve this goal. The scientific literature will also be analysed to identify current trends in the development of CLIL and best practices.

Research questions

1. How do web applications affect students' academic performance in CLIL programmes?
1. What impact do web applications have on developing students' communication skills?
2. How do web applications affect students' motivation to learn?
3. What are teachers' main challenges when integrating web applications into CLIL programmes?

Theoretical Framework or Literature Review

Theoretical foundations of CLIL (Content and Language Integrated Learning)

Content and language-integrated learning (CLIL) is becoming an increasingly common approach in higher education. It allows for the combination of foreign language learning with the acquisition of various academic disciplines. CLIL is a method of bilingual learning that uses a foreign language as a tool for mastering subject knowledge (Marsh & Pérez, 2024). Thanks to this approach, students improve their linguistic competencies and deepen their knowledge in the relevant fields.

According to Waloyo, Khoiriyah & Farah (2021), a critical factor in the successful implementation of CLIL is the integration of web applications, which can significantly improve the efficiency of the learning process. Using online resources contributes to creating interactive learning materials that increase student motivation and provide access to relevant information (Štefková & Danihelová, 2023). Video conferencing platforms, interactive whiteboards, and online courses make classes more dynamic and attractive to students.

As modern students are often exposed to a large amount of information through the media and the Internet, the CLIL method helps them navigate this information flow by developing critical thinking and analytical skills (Li & Zhang, 2022). Integrating web applications into the learning process allows teachers to create various tasks that stimulate discussion, teamwork, and independent activity (Destari & Kusumawati, 2023). CLIL technology is developing to integrate educational and scientific institutions into the global community. This approach aims to develop social, cultural, cognitive, linguistic and academic skills, which contributes to achieving both subject and language outcomes (DelliCarpini, 2021). CLIL teachers should use the latest techniques and strategies to improve student achievement (Morgado et al., 2019).

In addition, according to Kaewkamnerd, Dibyamandala, Mangkhang & Khuankaew (2024), CLIL technology is becoming increasingly popular among future teachers, most of whom integrate CLIL lessons with digital applications. According to a survey conducted by Junior (2020), the most commonly used learning tools are Quizizz, Kahoot and LearningApps.

The theoretical underpinnings of CLIL pedagogy are diverse and not reducible to a single approach or model. It is an interdisciplinary approach based on socio-constructivist theory that emphasises the importance of learning at the individual and social levels (Nikula et al., 2016).

CLIL in higher education contributes to developing disciplinary, linguistic, cognitive and intercultural skills (Marsh & Pérez, 2024). Studies point to the cognitive benefits of implicit language learning, which enables reflective analysis of language material (Banegas & Zappa-Hollman, 2023). The cognitive component encompasses the processes of reflection and awareness of the content within the learning material.

Empirical research in CLIL pedagogy demonstrates the diversity of its practices (Barçante, 2020), which is related to the specificity, intensity and didactic priorities. Researchers identify three main models of CLIL pedagogy: The first is short language classes two or three times a week lasting 20-30 minutes with songs and games (Babault et al., 2022); the second model is modular, where individual topics of a discipline (e.g. mathematics) are taught in a foreign language (Silva, 2022); the third is the whole teaching of one or more subjects in a foreign language during the school year (Dalton-Puffer et al., 2022).

The results of research and implementation of CLIL in higher education emphasise its positive effects. For example, Porto (2021) notes that this approach contributes to developing language skills and deeper learning. According to research, students enrolled in CLIL programmes demonstrate better language competence and a better understanding of both their native and foreign languages (Kuhna, 2019). It also increases student motivation and encourages active participation in learning.

Improvements in CLIL technology can be made through teacher training, the introduction of new methods, and the provision of guidelines for educational institutions (Porcedda & González-Martínez, 2020). To ensure high-quality education, it is important that teachers are trained in CLIL methods and familiar with technologies that support interactive learning (O'Connell & Chaplier, 2021; Radziievska et al., 2022). This includes mastery of bilingual teaching methods and the ability to adapt learning materials to students' needs.

Thus, CLIL is an effective tool for improving learning in higher education, especially when integrated with modern technologies. Web-based applications are becoming essential in creating an engaging and interactive learning environment that prepares students for the challenges of today's globalised world.

Methodology

Data Design

The basic method used to achieve the research goal was a literature review. This method identified existing practices, approaches, and challenges when integrating web applications into content and language-integrated learning (CLIL). In addition, the study is based on empirical observations and analysis of pedagogical practice at the Military Faculty of International Relations and Law of the Military Institute of Taras Shevchenko National University of Kyiv (Kyiv, Ukraine).

Various sources, such as scientific articles, monographs, and analytical reports, were used to collect information. The main databases from which the research materials were taken are Scopus, Web of Science, and Google Scholar. This ensured the reliability and relevance of the information collected.

Objectivity in selecting sources was ensured by excluding materials produced in countries with potential political bias. This allowed us to minimise the risk of subjective factors influencing the research results by focusing on neutral and scientifically sound sources. The participants in the systematic review were scientists, educators, and researchers who specialise in integrating interactive technologies into the learning process to improve the quality of education and develop scientific competencies. The selection of participants was based on their contribution to the field through publications in peer-reviewed journals and participation in educational practices that incorporate technology. The selection process followed a

systematic search strategy aimed at including relevant and diverse studies that highlight interactive technologies in the educational environment. The final sample consisted of 50 peer-reviewed articles selected to comprehensively analyse current trends and practices in the use of interactive technologies in education. This sample size was sufficient to provide comprehensive information on the main thematic areas, supported by content richness and data triangulation.

Key themes and terms such as 'development of language and subject competence', 'digital learning environment', 'CLIL programmes in higher education', 'development of language skills', and 'motivation enhancement' were used to guide the literature search. The information was collected based on its relevance to the research questions, which included research design, sample characteristics, and results on the effectiveness of interactive technologies in education.

Data Selection

The search for scientific literature was carried out using keywords such as "web applications," "CLIL," and "interactive learning." The initial search yielded 250 results.

Only sources that contained specific information about web-based applications or interactive technologies in education were selected. After selection, 150 sources were removed, leaving 100 relevant articles.

To determine the study's timeframe, it was established that only publications from the last five years would be included. Out of the 100 selected sources, 50 publications published before 2019 were excluded, leaving 50 articles (Fig. 1).

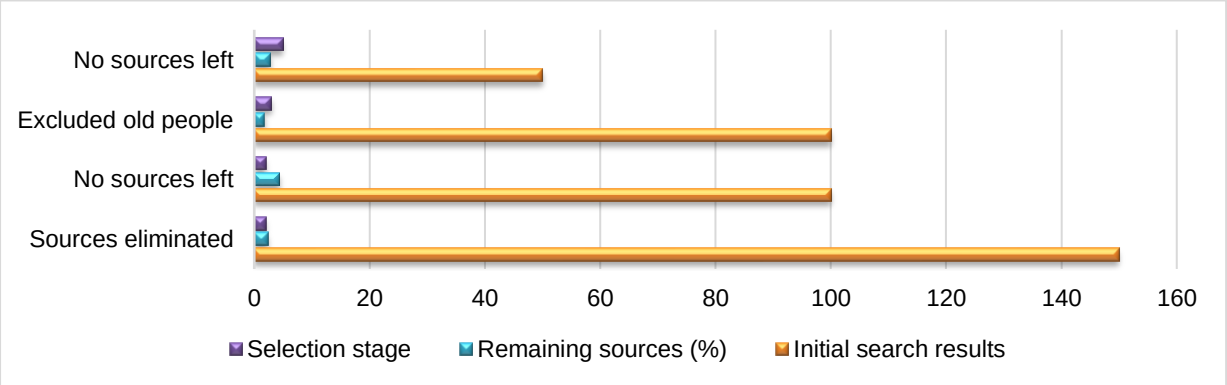

Fig. 1. Selection of the database for análisis.
Source: authors' own development.

Additional criteria were applied, such as a focus on interactive technologies in foreign language teaching. After this filtering, 50 sources remained, which became the basis for further analysis.

To process the collected data, content analysis was used to identify the main approaches to integrating web applications into CLIL teaching. The analysis revealed key themes and issues that highlight the practical aspects of implementing these technologies.

Observing the classes collected empirical data, which helped collect qualitative data on the author's web application experience (Fig. 2).

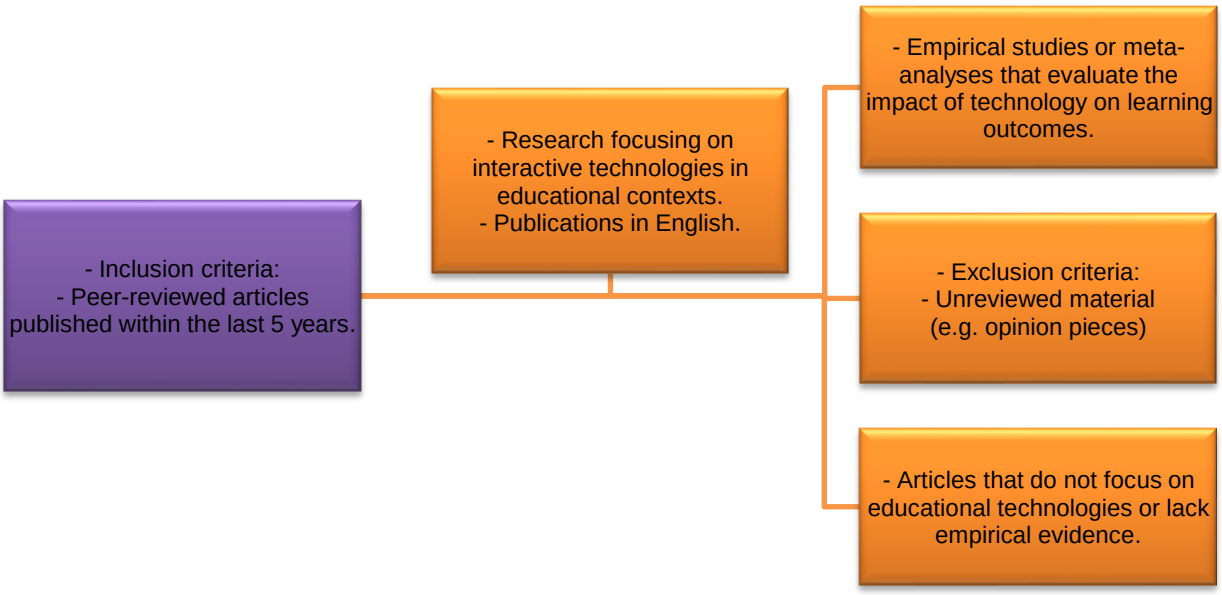

Fig. 2. Criteria for selecting data for análisis.
Source: authors' own development

The data was collected using a pre-designed coding system focused on the research objectives, methodology, sample characteristics, interventions and outcomes. The extracted data were synthesised through thematic analysis, which allowed the results to be classified into subthemes, approaches, and challenges related to integrating web applications into the CLIL methodology.

The results of the analysis of scientific sources convincingly demonstrate the effectiveness of introducing web applications into the educational process using the CLIL method, emphasising the importance of modern technologies in improving the quality of learning and developing students' language skills.

The analysed studies examined the impact of web applications, interactive technologies, and CLIL methodology in the educational environment on increasing students' motivation, engagement, and communication competence.

Ethics

The paper provides a comprehensive and balanced literature review, reflecting both the potential benefits and limitations of integrating web-based applications into CLIL programmes. The authors' actions contributed to intellectual honesty to prevent bias in the interpretation of the effectiveness of web-based tools in the educational environment.

Limitations

The study has the following limitations. First, it focuses on certain time periods. The analysis covered only publications between 2019 and 2024, which may lead to the omission of important information and experience gained in previous years, which could also have influenced the development of CLIL practices. Second, geographical limitations. Despite the involvement of Ukrainian and international research, the results may be overly concentrated on certain countries or regions of Europe, which may limit the generalisability of these findings at the global level.

Finally, the analysis was based on a literature review, which may contain some subjectivity or bias of the authors of the included publications, as well as variations in methodological approaches used in different sources.

Results

Integrating web applications into content and language-integrated learning (CLIL) programmes in higher education is essential to the modern educational process. The use of digital tools and web applications improves the quality of learning and creates a favourable environment for the simultaneous acquisition of professional knowledge and foreign language learning (Kukulska-Hulme et al., 2024). Through interactive technologies, students can better understand the material, access a wide range of resources, and engage in intercultural communication.

In CLIL programmes, web-based applications can create virtual classrooms and conduct online discussions, group projects and tests. Interactive platforms such as Moodle, Google Classroom, or specialised CLIL applications allow you to organise practical work with large amounts of information, automate assessment processes, and maintain constant feedback between students and teachers (Şentürk, 2021).

Using web-based technologies in CLIL teaching contributes to developing critical thinking, problem-solving, collaboration and creativity skills, which are essential for academic success and professional training in a globalised world.

The staff of the Department of Special Language Training of the Military Faculty of International Relations and Law of the Military Institute of Taras Shevchenko National University of Kyiv (Kyiv, Ukraine) are actively implementing pilot projects and conducting research in the field of teaching foreign languages, including English as a foreign language. The analysis of scientific literature and personal observations made it possible to identify the main advantages of using the CLIL method and define its goals and expected results. The research conclusions show that the results are similar to those in other European countries. The observations are focused on the following main aspects (Fig. 3):

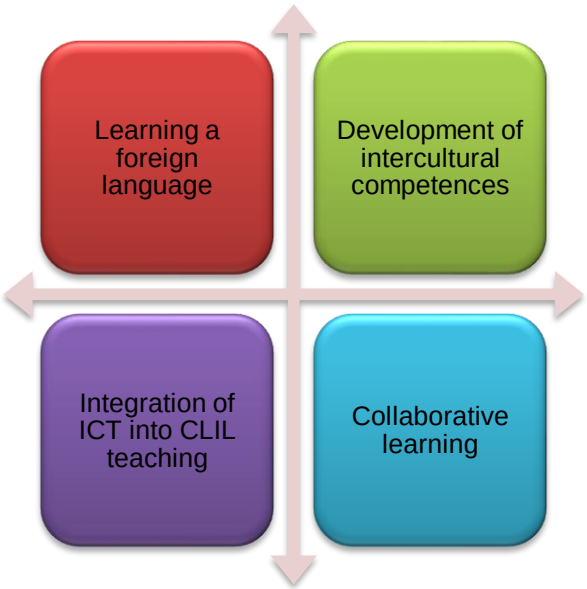

Fig. 3. The main themes in the integration of CLIL in higher education.
Source: authors' own development.

Pilot projects are usually implemented in senior years, where students have a higher level of foreign language proficiency. In addition to English, German and French are also used as target languages (Fakhar et al., 2024; Paweloszek et al., 2022).

In the Ukrainian context, CLIL is used to teach such disciplines as international law, geopolitics, and military affairs. These projects are implemented with the support of university structures and educational advisors. Teaching is often conducted by foreign language teachers in collaboration with experts in the relevant fields. Teaching materials are developed by teachers themselves, as there are not enough specialised textbooks for CLIL in Ukraine.

Public higher education institutions in Ukraine are divided into general and experimental, with the latter offering innovative learning models. In recent years, several CLIL projects have been implemented in higher education aimed at improving language skills and developing students' intercultural competencies.

In particular, the Military Faculty of International Relations and Law of the Military Institute of Taras Shevchenko National University of Kyiv (Kyiv, Ukraine) implemented projects in which students learned English through interactive classes and online resources. These initiatives helped to improve language skills, actively engage students in the learning process, and develop their independence.

After completing the pilot projects on the use of CLIL technology, the staff of the Department of Special Language Training of the Military Faculty of International Relations and Law conducted an analysis of its implementation in the educational process. The study covered students' views on the combination of subject and language learning, as well as their attitudes towards the integration of these approaches. An important role in the study was played by the use of web-based applications and the experience of implementing CLIL technology in educational institutions. In particular, the difficulties and advantages of integrated learning were studied, as well as students' suggestions for its improvement.

The results of the study showed that a significant number of students positively perceive CLIL technology, emphasising its importance for the learning process and the development of intercultural competences.

The integration of CLIL technology at the Military Faculty of International Relations and Law of the Military Institute of Taras Shevchenko National University of Kyiv (Kyiv, Ukraine) has had a positive impact on students' training, allowing them to combine language learning with disciplines that are important for their professional activities. Many students believe that this integration of subject and language learning contributes to the development of critical thinking and independent work, introducing innovations in the learning process, increasing cognitive activity and motivation, and making learning more interesting and effective.

The integration of web applications into content and language-integrated learning programs also contributes to the successful implementation of CLIL (Kic-Drgas et al., 2024). The use of modern technologies provides students with the opportunity to acquire knowledge of disciplines and simultaneously develop language skills in an interactive environment. This creates new opportunities for improving professional competencies and enhancing the quality of education, which is especially important for future professionals in the field of international relations.

Faculties are actively using web-based applications such as Quizizz, Kahoot, LearningApps.org, Wordwall, Wooclap and Google Classroom. CLIL technology is gradually being introduced in Ukraine, but students have different opinions about its effectiveness. Some of them are against it, while others support this approach, believing that it should be introduced from the beginning of their studies, as it helps them to master the subject and the foreign language faster. Innovations are always necessary; as the better the education system develops, the more it contributes to the improvement of students' skills.

Students noted that the integration of subject and language learning has its challenges, including the need

to constantly update the methodology, high time costs, the risk of misunderstanding the material, the need for additional training for students and teachers, and a lack of focus on implementation. However, among the advantages of learning a foreign language, students noted the comprehensive development of the individual. In this context, the authors, based on their own experience, offer recommendations for improving the CLIL technology (Table 1).

Table 1.
Prospects for improving CLIL technology

Expanding teacher training	Conducting trainings and seminars for teachers so that they can effectively use CLIL in their practice.
Development of standardised training materials	Creation of textbooks and resources specifically adapted for CLIL to help teachers prepare classes.
Integration of modern technologies	Use of digital tools and web applications to support the learning process and increase student engagement.
Interdisciplinary approach	Encourage collaboration between teachers of different subjects to create integrated courses that combine content and language.
Regular monitoring and evaluation	Introduce a CLIL performance evaluation system to identify successful practices and areas for improvement.
Student engagement	Active involvement of students in the learning process, including their feedback and suggestions for improving the technology.
Efficiency studies	Conducting research that evaluates the impact of CLIL on learning outcomes in order to justify its use in the education system.
Sharing successful experiences	Organise conferences and exchange of experience between higher education institutions to promote successful CLIL implementation practices.

Source: authors' own development

Analysing the experience of introducing CLIL technology at the Military Faculty of International Relations and Law of the Military Institute of Taras Shevchenko National University of Kyiv (Kyiv, Ukraine), it can be argued that the number of professionals who are proficient in CLIL and actively use it in every class remains insufficient. Ukraine trains specialists with profound knowledge of foreign languages, but despite the support of this technology by many students, a significant number of students of humanities specialities do not show the same interest. This is partly due to the specifics of the disciplines.

Discussion

Thus, in the above paper, the literature analysis allowed us to answer the key questions related to the integration of web applications into content and language integrated learning (CLIL) programmes in higher education.

Firstly, research has shown that the use of web-based applications can significantly contribute to improving students' understanding of academic material. Digital tools provide access to interactive and visualised resources that make complex concepts easier to grasp, and improve test scores and other academic performance.

Secondly, the literature analysis revealed that the integration of digital tools has a positive impact on the development of student's language and communication skills in the context of CLIL. The use of web-based applications for group discussions, interactive exercises, and collaborative work in online environments contributes to the more effective acquisition of language competence and improved communicative interaction.

Third, we analysed how digital tools affect students' motivation to learn. The use of web-based applications makes the learning process more engaging and dynamic, increasing students' interest and facilitating their active participation in the educational process.

The study also revealed the main challenges faced by teachers when implementing web-based applications in CLIL. The main difficulties include technical problems, insufficient knowledge of new teaching methods and resource management, which requires additional training and support for teaching staff.

Thus, the literature analysis not only confirmed the positive impact of web-based applications on the educational process in CLIL, but also highlighted the main challenges faced by teachers in the process of their integration.

These results correlate with the work of Byrko et al. (2022), who emphasise that CLIL is still an innovation that is used only by some higher education institutions. The problem of adapting CLIL to Ukrainian curricula has also been studied. The problem is that most of them focus on preparing students for international language certifications such as IELTS or DELF, which is different from CLIL teaching (Boichenko et al., 2023). In related works, researchers also find that there is a lack of necessary teaching materials and resources for CLIL implementation, which becomes a significant obstacle to its implementation.

The results are partially consistent with the findings of studies conducted in European countries. For example, Papaja (2023) notes that the introduction of CLIL has become particularly popular in European higher education due to the dominance of English among foreign languages. However, it is worth emphasising the difference between CLIL and English as a medium of instruction (EMI), which was also noted in this study. This distinction allows for a deeper analysis of the specifics of each approach and the selection of the most appropriate methods for the Ukrainian context.

On the other hand, the results of this study differ somewhat from the findings of Amor, Tinedo-Rodríguez and Osuna-Rodríguez (2023), who argue that the implementation of CLIL in European universities is more organised and supported at the state level. While CLIL is increasingly being used in Europe, Ukrainian teachers face challenges due to insufficient training, lack of methodological frameworks and limited resources. In this study, these problems were identified as some of the main obstacles to the successful integration of CLIL into the higher education system.

Interpretation of the results of this study indicates that although CLIL has significant potential to improve the quality of learning, its implementation requires a systematic approach. One of the unexpected findings of our study is that, despite limited resources and the lack of ready-made teaching materials, teachers show a high interest in this methodology (Myronenko et al., 2024). They are ready to develop didactic materials on their own, although it requires considerable effort and time. As Chashechnikova et al. (2024) emphasise, the integration of innovative technologies into educational practices fosters critical thinking skills, an essential component for students' cognitive and professional development. Furthermore, the study showed that students enjoy the interactive nature of CLIL classes, which contributes to the development of their language and academic skills. This finding confirms the results of other studies, such as Galán-Rodríguez et al. (2024), who emphasise the importance of an interactive approach and teachers' dual competence in language and subject matter didactics. However, in order to ensure effective teaching, it is necessary to develop a teacher training system that meets the specifics of CLIL. Web-based applications such as interactive learning platforms, video conferencing, virtual laboratories, and mobile language learning can make the learning process more dynamic and convenient for students. For example, platforms such as Kahoot, Quizlet or Edpuzzle promote active engagement of students in the learning process by allowing them to complete tasks interactively, compete with each other, watch videos with integrated questions and discuss topics in real-time (Navarro Henares, 2020; Settelmeyer et al., 2019).

Interactive platforms provide immediate feedback, which plays an important role in consolidating knowledge and maintaining student interest. For example, Kahoot, as a gaming platform for creating quizzes, not only allows students to demonstrate their knowledge but also promotes competition in a fun and motivating atmosphere (Zainuddin et al., 2024). This, in turn, helps to develop teamwork skills, critical thinking, and responsiveness. The use of such platforms makes lessons much more interactive than traditional teaching methods, which encourages students to be more active in learning.

According to Rebolo Roca (2021), Quizlet, as a flashcard tool, promotes the memorisation of new terms and concepts through repetition, using a variety of formats such as quizzes, games and flashcards. This is extremely useful for learning new vocabulary in a CLIL context where students need to learn both subject material and a new language at the same time. Students have the opportunity to create their own sets of flashcards, adapting the material to their individual needs and level of proficiency (Vonitsanos et al., 2024). Edpuzzle allows teachers to integrate videos with questions, which allows students to better absorb information through visual and audio formats (Díez-Pascual & Díaz, 2020). Students can pause the video, answer questions, and receive instant feedback, which helps them gain a deeper understanding of the topic. The study by Hegde et al. (2022) shows that the use of such web-based applications significantly increases student motivation, improves learning efficiency, and provides greater flexibility in the process of acquiring new knowledge.

Like any study, the present one has certain limitations. Firstly, the limited number of educational institutions implementing CLIL in Ukraine affected the generalisability of the results. Secondly, due to the lack of resources and teaching materials, many teachers were unable to fully implement CLIL, which could affect the quality of the data collected. Thirdly, the study involved mainly students of humanities, which may limit the applicability of the results to other fields of study.

Despite these limitations, the study has made a significant contribution to the development of the scientific debate on the implementation of CLIL in higher education in Ukraine. It has identified key problems and challenges faced by Ukrainian teachers and students and suggested possible ways to overcome them. The scientific novelty of the study lies in the fact that the specifics of CLIL implementation in the context of the Ukrainian education system, which has not been the subject of a comprehensive analysis before, were considered in detail.

The results of the study indicate that the adaptation of CLIL in Ukrainian higher education is possible, but it requires more resources, teacher training and the creation of specialised teaching materials. The use of web-based applications and other modern technologies can be a key factor for the effective implementation of this method. This study can serve as a basis for further research in this area, in particular on the impact of CLIL on students' academic achievement in different disciplines.

Integrating CLIL into higher education is a promising approach to developing students' language and academic skills. However, its successful implementation requires solving a number of problems, including providing teachers with the necessary resources and materials, as well as the possibility of taking specialised courses to prepare them for teaching using this methodology. Further research should focus on finding the best ways to integrate CLIL into various curricula in Ukraine.

Conclusions

Thus, the study results show that technologies significantly increase the interactivity of the educational process, contribute to improving students' language skills and provide an opportunity to individualise learning. The use of web-based applications, such as Kahoot and Quizlet, positively impacts student engagement in learning, allowing them to complete tasks in the form of competitions and discuss topics in real-time. Students who use online resources to learn foreign languages demonstrate a higher level of language competence than those who study using traditional methods. Technology provides students access to various information sources, which contributes to developing their critical thinking and analytical skills. Mobile language learning applications allow students to choose the pace and level of complexity of the learning material, which contributes to a more profound learning experience. Technology also facilitates preparing lessons and providing feedback, but teachers must be trained to use it effectively.

The study's scientific novelty lies in its comprehensive assessment of CLIL's effectiveness in the Ukrainian context, with an emphasis on the role of digital technologies in the educational process.

The study's practical significance lies in the development of recommendations for improving the practice of teaching using the CLIL methodology in Ukraine's higher education institutions (Budko et al., 2024). The results can be used to develop teaching aids, conduct teacher training, and adapt curricula.

In this context, further research could focus on the impact of specific web-based applications on students' learning outcomes in CLIL and different disciplines and on a detailed analysis of their contribution to the development of language and academic competence. It is also essential to investigate how different levels of resource provision affect the effectiveness of technology integration in the learning process.

It is promising to develop recommendations for teachers on integrating technology into CLIL, particularly in assessing learning outcomes and providing quality feedback using digital tools.

Thus, further research should contribute to improving the methodological approaches and practices for introducing technologies into the educational process, which will ensure more effective and efficient learning within the CLIL methodology.

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