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CREATING EQUITABLE LEARNING ENVIRONMENTS THROUGH CLIL TECHNOLOGY: BRIDGING LINGUISTIC AND COGNITIVE GAPS IN EDUCATION

Nurmuxammadova D.J.
Chirchiq state pedagogical university, teacher in Tourism faculty

Tayanch so'zlar: kontent va tilni integratsiyalashgan o'rganish (CLIL), samarali til o'rganish amaliyotlari, ta'lim texnologiyalari, teng huquqli ta'lim, ko'p tillilik, kognitiv faollik, inklyuziv ta'lim.
Ключевые слова: интегрированное обучение содержанию и языку (CLIL), эффективные практики изучения языка, образовательные технологии, равный доступ к обучению, многоязычие, когнитивная вовлеченность, инклюзивное образование.
Key words: content and Language Integrated Learning (CLIL), effective language learning practices, educational technology, equitable learning, multilingualism, cognitive engagement, inclusive education.

РЕЗЮМЕ:
Content and Language Integrated Learning (CLIL) — bu yo'nalishi ingliz tili bo'lmagan talabalar uchun bir vaqtning o'zida o'zining fanini va ikkinchi tilni birgalikda o'rgatish orqali o'quvchilarning til ko'nikmalarini rivojlantirishga yordam beradigan samarali pedagogik yondashuvdir. CLIL metodologiyalarining texnologiyalar bilan integratsiyasi teng huquqli ta'lim muhiti yaratish, turli xil lingvistik va kognitiv ehtiyojlarga ega o'quvchilarga yordam berish imkonini beradi. Ushbu ilmiy maqola CLIL texnologiyasining inklyuziv ta'lim muhitini yaratishda samaradorligini, tilga kirish imkoniyatlarini oshirish, kontentni tushunish va kognitiv faollik kabi turli o'quv jarayonlari orqali tahlil qiladi. Tadqiqotda raqamli vositalar lingvistik to'siqlarni yengib o'tishga va ta'limdagi tenglikni rivojlantirishga yordam beradimi yoki yo'qmi, shuningdek, o'qitish jarayonidagi muammolarni qanday hal qilish va til o'rganish jarayonini samarali va oson qilish uchun qanday yaxshiroq amaliyotlarni taklif qilish kerakligi ko'rsatilgan. Natijalar shuni ko'rsatadiki, CLIL texnologiyasi va kontent asosidagi fanlarning integratsiyasi nafaqat o'quvchilarning til ko'nikmalarini, balki ularning kontentga asoslangan bilimlarini ham bir vaqtda samarali ravishda oshirishi mumkin, ayniqsa, ko'p tilli va ko'p madaniyatli kontekstlarda.
РЕЗЮМЕ:
Интегрированное обучение содержанию и языку (CLIL) является одним из эффективных педагогических подходов, при котором одновременно преподаются учебные дисциплины и второй язык, что способствует развитию языковых навыков учащихся через содержание неспециализированных предметов. Интеграция технологий с методологиями CLIL способствует созданию равноправной образовательной среды и обеспечивает поддержку обучающимся с различным языковым и когнитивным уровнем. В данной научной статье рас-

сматривается эффективность технологии CLIL в создании инклюзивной образовательной среды через различные методы преподавания и обучения, такие как: расширение языковой доступности, понимание содержания и развитие когнитивной вовлеченности. Исследование анализирует, могут ли цифровые инструменты преодолеть языковые барьеры и способствовать образовательному равенству, а также предлагает пути решения возникающих проблем и лучшие практики для повышения эффективности процесса изучения языка. Результаты показывают, что сочетание технологии CLIL и неспециализированных предметов может эффективно способствовать одновременному развитию как языковых навыков, так и предметных знаний учащихся, особенно в многоязычной и мультикультурной среде.

SUMMARY:

Content and Language Integrated Learning (CLIL) is one of the effective pedagogical approach that teaches content based subjects and a second language simultaneously, which improves learners' language skills through content in non-specific subjects. The integration of technologies with CLIL methodologies offers fostering equitable learning environments, providing support for learners with diverse linguistic and cognitive needs. This scientific article examines effectiveness of CLIL technology in creation of inclusive learning environments by different ways of teaching and learning processes such as: enhancing linguistic access, content comprehension, and cognitive engagement. The research explores whether digital tools can bridge linguistic barriers and promote educational equity or not, by offering how to address challenges and propose better practices and ways in order to make language learning process efficient and easier. The results promises that the combination of CLIL technology and non-specific subjects can effectively rise not only students' language skills and also content based knowledge simultaneously, especially in multilingual and multicultural contexts.

Introduction. Educational equity stays a crucial challenge in educational systems, especially in multilingual and multicultural contexts. Content and Language Integrated Learning (CLIL) has emerged as a promising approach that teaches both academic content and a foreign language, allowing students to improve their language proficiency while mastering subject matter (Coyle, Hood, & Marsh, 2010). Traditional methods of instruction not only fail to address the diverse linguistic and cognitive needs of learners, which results educational disparities and misunderstandings. Learners face challenges in language learning processes. But implementation of CLIL technology is effective approach bridging language and cognitive gaps between learners from varied backgrounds. Technological advancements in education offer new opportunities to create more equitable learning environments. By integrating technology into CLIL, educators can provide individualized support to students, enhance cognitive engagement, and promote inclusive participation in the learning process (R. Thomas & Reinders, 2018). This article investigates effectiveness of CLIL technology in creation of equitable language learning environment which is essential for the linguistic and cognitive diversity of learners. CLIL involves teaching both academic content and a foreign or second language simultaneously, providing a unique framework for supporting both language acquisition and cognitive development (Coyle, Hood, & Marsh, 2010). CLIL is rooted in the idea that learning content through a second language enhances cognitive development and facilitates bilingualism

or multilingualism. Unlike traditional language teaching methods, which focus primarily on language structures and vocabulary, CLIL uses content to engage students in meaningful, context-driven learning experiences (Mehisto, Marsh, & Frigols, 2008)

Methodology. This study examines the integration of CLIL technology and content based subjects (history, and others) in multilingual classrooms. A systematic review of the literature was done in order to examine how digital tools are effective in equitable learning and how they are used in modern classrooms. The article review includes articles that were published between 2010 and 2024 years, focusing on the intersection of CLIL technology and educational equity in language learning environments. Moreover, a case study methodology was utilized for examining two schools in diverse linguistic communities that have implemented CLIL technology in their learning processes. The schools were chosen according to their use of modern digital tools and technologies, supporting language learning processes and content comprehension in CLIL methodology. The information was collected through interviews with teachers and surveys with learners and additionally from classroom observations. In CLIL setting modern technological tools like: language learning apps, softwares for speech recognition, translation services have been found to crucially help for improvement of learners' language acquisition and content based knowledge. These suggest scaffolding for learners in order to access content in their second language, improving their not only comprehension but also engagement simultaneously. In the classrooms that CLIL technology is utilized, it is usually common that there are linguistic challenges occur. The reason for this is that classroom language is a foreign language which is not much familiar for learners. In modern technological world, technologies make the process easier and interesting, supporting help and individualized support for learners.

- Language Support Software: Tools such as online dictionaries, translation apps (e.g., Google Translate), and language learning platforms (e.g., Duolingo) allow students to access content more easily, reducing the cognitive load associated with language acquisition (Stockwell, 2018). These tools can also be used to support students' independent language development outside of formal lessons.
- Speech Recognition Tools: Speech-to-text applications can assist students in expressing their ideas in writing, particularly when they struggle with spelling or grammar. This technology allows students to focus on content rather than language form (Fitzpatrick & Colley, 2018).
- Multilingual Content: The availability of content in multiple languages, such as e-books with built-in translation or subtitled educational videos,

helps students to access materials in a language they understand while still engaging with subject-specific content (Marsh, 2012).

According to a study by P. L. Wilson (2017), interactive vocabulary tools, coupled with multimedia resources, enable students to grasp key subject-related terms more effectively, thus facilitating their cognitive processing. In conducted case studies both schools utilized modern technologies for provision of bilingual or multilingual learning materials and handouts. For example, one of the schools that was chosen employed a platform, supporting content not only in English language but also learners' native language in order to allow for accessible learning environment. The other school provided a speech recognition tools and platforms, offering practices for pronunciation and fluency with feedback simultaneously. Adaptive learning platforms, powered by artificial intelligence (AI), are able to personalize learning processes by adjusting the level of difficulty according to learners' performances and cognitive abilities. These modern technologies offer real-time feedback, allowing learners to progress at their own pace while receiving tailored support. In the classroom case studies, two schools utilized AI-driven platforms which provided learning paths according to learners' individual language learning abilities and proficiency. For instance, a gamified language learning platform utilized in one school suggested to take part in language-rich content games that are very essential for improving students overall knowledge and proficiency. The platform adjusted the complexity of tasks based on the cognitive abilities of learners, ensuring that they were always appropriately challenged without feeling overwhelmed. This form of engagement has been linked to improved academic outcomes (Liu, 2020). The integration of culturally, modern teaching practices with the help of technology was essential in both case studies. Digital tools offered instructors to incorporate culturally relevant materials and content on subjects, suggesting an inclusive learning environments. Virtual reality (VR) and augmented reality (AR) technologies were utilized for creation of immersive environments where learners could experience content based information through simulations, thereby connecting abstract knowledge to real-world contexts. For example, learners in one classroom utilized VR to show historical events in the target language, enhancing both subject comprehension and cultural awareness. These tools not only improved content mastery but also promoted cross-cultural understanding, which is vital in a diverse educational setting (Dooly & Vallejo, 2019).

In the classrooms that include CLIL methodology students usually accept linguistic and cognitive information simultaneously. Integration of technology into CLIL offer mitigation of cognitive overload and help learners in management for content learning and language learning processes.

- Multimodal Learning Tools: Multimedia resources (e.g., videos, infographics, and interactive simulations) allow students to engage with content in various formats, catering to diverse learning styles and facilitating comprehension (Laurillard, 2012). For instance, visualizing complex scientific processes through animated simulations can help students understand abstract concepts that might be difficult to grasp in a traditional classroom setting.
- Adaptive Learning Systems: AI-powered learning platforms, such as Duolingo for Schools or Smart Sparrow, can adapt to the needs of individual learners, providing personalized pathways through content and language exercises based on their progress (Vollmer, 2020). These systems allow for differentiated learning, ensuring that all students, regardless of their starting point, can access appropriate challenges and supports.
- Collaborative Learning Tools: Digital platforms that support collaborative learning (e.g., Google Classroom, Padlet, or Zoom) allow students to work together in both synchronous and asynchronous settings, thus promoting communication in the target language while simultaneously reinforcing the content being studied (Reinders & White, 2011). This can help students with different cognitive strengths contribute to collective knowledge-building, fostering a more inclusive classroom environment.

Results and Discussions. The findings offer that CLIL technology plays an essential role in creating equitable learning environments by addressing both linguistic and cognitive barriers. By suggesting personalized, real-time support, technology enables learners to engage with academic content in a second language without being hindered by language barriers. This personalized approach is particularly beneficial for students with varying levels of language proficiency, ensuring that they all have the opportunity to succeed in both content and language acquisition (Coyle et al., 2010). Nevertheless, the effectiveness of CLIL technology is contingent on several reasons, such as equitable access to technology and teacher readiness.

A key challenge identified in the case studies was the need for teacher training in both CLIL methodology and technology integration. Teachers must be equipped not only with the technical skills to use educational technologies but also with the pedagogical knowledge to effectively integrate these tools into their CLIL instruction. Professional development programs are necessary to build this capacity (R. Thomas & Reinders, 2018). In both case studies, schools highlighted challenges with digital infrastructure, especially in some places where funding is limited and there is some problems with technology usage. While technology offers effective potential, unequal access affects educational disparities and

inequality. It is very crucial that all learners have access to technological tools and platforms, besides their socioeconomic background and economic situations of their family situations. Moreover, aligning technological tools with curriculum objectives keeps challenges. While there are availability of digital tools and technologies, their alignment with language learning goals and content based subject should be considered in order to avoid fragmentation of the curriculum. Technology enables educators to design learning experiences that cater to the individual needs of students. Adaptive learning systems and language support tools provide students with tailored content and assessments, ensuring that they receive appropriate scaffolding based on their proficiency levels (Harrison, 2016).

Conclusion. This scientific study offers the potential usage of CLIL technology in creation of effective language learning environments which bridge linguistic and cognitive gaps. By utilizing digital tools and technologies, instructors can suggest personalized support which enhances not only understanding of content and language skills. However, for unlocking the effectiveness of CLIL technology, teacher training and curriculum integration need to be resolved. Overall, usage of CLIL technology and modern platforms and digital tools in language learning processes offers various advantages and positive results that affect learners' overall knowledge not only in content based courses but also in language lessons. In future, effectiveness of CLIL technology in language learning process will be studied and results of students before and after the study will be presented.

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