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DISEÑO DE UN PLAN DE ESTUDIOS DE CIENCIAS NATURALES BASADO EN CLIL PARA EDUCACIÓN PRIMARIA

DESIGNING A CLIL-BASED NATURAL SCIENCE SYLLABUS FOR PRIMARY EDUCATION SCHOOL

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Diseño de un plan de estudios de ciencias naturales basado en CLIL para educación primaria

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RESUMEN

Este artículo presenta un proyecto de innovación centrado en el diseño de un plan de estudios, basado en el Aprendizaje Integrado de Contenidos y Lenguas Extranjeras (CLIL) para la enseñanza de ciencias naturales en inglés, en un colegio privado de Bogotá, Colombia. El estudio integró aprendizaje de contenidos científicos e inglés, mediante un plan de estudios basado en contenidos (CBS) y estrategias de aprendizaje basado en proyectos (ABP). Se realizó un análisis de necesidad con docentes y directivos, seguido de la alineación curricular y la implementación piloto de planes de clase en un grupo de tercer y quinto grado. El estudio adoptó un diseño cualitativo e interpretativo mediante observaciones de clase, diario reflexivo del docente y entrevistas a los estudiantes. Los hallazgos evidenciaron dos categorías principales: (1) el impacto pedagógico y metodológico del enfoque CLIL y del ABP, y (2) el diseño instruccional y la adaptabilidad docente. Los resultados mostraron que los estudiantes mejoraron su comprensión científica, sus habilidades lingüísticas y su motivación, mientras que los docentes demostraron flexibilidad en la adaptación de estrategias. El proyecto resalta el potencial del enfoque CLIL para promover un aprendizaje significativo en ciencias e inglés, ofreciendo un modelo replicable para la educación primaria.

Palabras clave: CLIL; plan de estudios basado en contenidos; aprendizaje basado en proyectos; educación primaria; bilingüismo en Colombia.

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Designing a CLIL-based natural science syllabus for primary education school

ABSTRACT

This article presents an educational innovation project focused on the design of a Content and Language Integrated Learning (CLIL) for teaching natural sciences in English at a private school in Bogota, Colombia. The study integrated scientific content and English language learning through a Content-Based Syllabus (CBS), complimented by Project-Based Learning (PBL) strategies. An initial needs analysis was conducted with teachers and school leaders, followed by the alignment of curricular content and the piloting of lesson plans in a third and fifth grade. The study adopted a qualitative, interpretative design using classroom observations, teacher, reflective journal, and students' interviews. Findings revealed two main categories: (1) the periodical and methodological impact of CLIL and PBL, and (2) instructional design, and teacher adaptability. Results demonstrate that students improved their scientific understanding, language, skills, and motivation while teachers displayed flexibility in adapting strategies. The project highlights CLIL's potential to foster meaningful learning in science and English, offering a replicable model for primary education in similar contexts.

Keywords: CLIL; content-based; syllabus; Project-Based Learning; primary education; bilingualism in Colombia.

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INTRODUCTION

Content and Language Integrated Learning (CLIL) represents a teaching approach that combines curriculum topics with language acquisition, aiming for a dual-centered form of instruction (Coyle et al., 2010). It aids learners by improving communication abilities, expanding comprehension of academic subjects, nurturing analytical thinking, and encouraging integrated learning. By employing English as a medium for gaining knowledge, CLIL facilitates mental skill development and a wider awareness of global contexts (Coyle et al., 2010).

To better grasp CLIL's influence, it is important to examine the various aspects it encompasses. As Mariño (2014) stated: "All of the reasons the authors state is given in terms of context, content, language, learning, and culture. CLIL prepares students for future studies and offers them a different point of view of sciences" (p. 153). This means that CLIL not only teaches subject matter but also creates a rich learning environment where context and culture are intertwined with academic content. Additionally, "students in CLIL programs have real access to specific information within different knowledge areas" (Mariño, 2014, p. 153). This integrated approach not only prepares students for future academic studies but also provides them with a unique perspective on various subjects, particularly in the sciences.

CLIL's main advantage is its ability to go beyond just teaching content and language, incorporating broader dimensions of learning. As highlighted by Martinez y Gutierrez (2015), "the 4Cs require that learning go beyond content and language and also address cognition and culture; cognition encompasses higher-level thinking, such as the development of critical thinking skills" (p. 249). In other words, content refers to knowledge in a real-world context; communication refers to the usage of a foreign language; cognition refers to thinking skills due to their scaffolding during the process between lower and higher cognitive processes; and culture refers to how students develop and understand other cultures. As explained by Chaya & Inpin (2020), "among the 4Cs, communication plays an important role because it requires an awareness of different types of language as used for different purposes" (p. 31). This framework of the 4Cs not only acquires knowledge but also engages in deeper thinking processes. Moreover, the cultural aspect gives context to their understanding which means it prepares students for real-life challenges.

Content-Based Syllabus (CBS)

Different types of syllabi outline what is to be learned, the course goals, the teaching methods, and the time required (Núñez, 2007). In second language teaching, different syllabi are connected, as Benbella (2019) noted, with some focusing on functional aspects of language, while others emphasize the development of learners' communicative skills. CBS emphasized learning about something or a specific topic that will be acquired rather than learning about grammar structure. CBS describes its principles from communicative language teaching (Benbella, 2019). This approach aligns with the principles of communicative language teaching, which prioritize real-life communication skills over rote memorization.

A CBS is an educational framework that prioritizes the instruction of subject matter while also promoting language acquisition. According to Snow (2016), this approach centers the course content as the driving force behind the curriculum, allowing language skills to be developed organically within the context of the subject matter. By integrating a content-based curriculum, educators create a dynamic learning environment where students engage with relevant topics, enhancing both their understanding of the subject and their language proficiency simultaneously. This dual focus not only enriches the learning experience but also equips students with the necessary skills to navigate both academic and real-world contexts effectively.

Also, the context in which language skills are applied in real-world scenarios is a key aspect of content-based curriculum development. The purpose of this approach is fundamental to education, as it enables learners to apply their language skills in practical, real-life situations. Gibbons (2002) asserts that, by designing a stimulating educational setting, teachers support both mastery of subject content and the development of language abilities, enabling learners to apply their linguistic skills in real-world situations.

In that sense, curricula focused on content enable teachers to design educational settings that cultivate both topic mastery and linguistic competence (Hempel-Jorgensen, 2015). This method enhances understanding of scientific ideas while developing terminology and expressive skills. Also, activities connected to the subject matter promote cognitive engagement and learning in the target language, fostering active participation and stronger memory of the material (Jalilzadeh & Tahmasebi, 2014).

Likewise, organized teaching techniques within Content-Based Instruction (CBI), such as genuine resources, stepwise guidance, and specific reading strategies, improve comprehension and language growth (Glenn, 2020). These practices stimulate thoughtful interaction with topics, supporting both grasp and assessment of content. In that sense, by incorporating practical materials, CBI generates purposeful learning opportunities that simultaneously reinforce academic expertise and language capability.

Project-Based Learning (PBL)

PBL is a student-focused approach that complements CLIL by prioritizing hands-on, authentic activities. This facilitates language development while integrating subject knowledge, giving learners practical chances to apply language in meaningful situations (Zhang et al., 2023). Therefore, PBL cultivates essential 21st-century abilities, such as teamwork, effective communication, and analytical reasoning, which are crucial in bilingual classrooms and real-life contexts (Bell, 2010). This involves students in both the content of their projects and the linguistic skills needed to accomplish them, encouraging practical and interactive use of language in CLIL environments (Fragoulis, 2009).

Given the above, applying PBL in instructional design promotes active student engagement in the learning process. It supports social, intellectual, and professional development through cooperative and independent activities, reinforcing both subject comprehension and language proficiency while fostering advanced thinking skills necessary for bilingual or additional-language education (Aksela & Haatainen, 2022).

English as a Second Language (ESL), English as a Foreign Language (EFL), and CLIL

CLIL is particularly significant for both EFL and ESL because it integrates language acquisition with subject learning, shifting from isolated language instruction to a comprehensive, context-based approach (Dalton-Puffer, 2011). This combination enables learners to simultaneously develop linguistic and content knowledge, strengthening English instruction.

Evidence shows that CLIL surpasses conventional EFL approaches by enhancing student interest and cognitive involvement through purposeful, real-world communication (Lasagabaster & Sierra, 2010). In that way, embedding academic topics within language lessons promotes authentic and meaningful use of the language, advancing both fluency and communication skills.

CLIL encourages intensive engagement by employing language as a tool for interdisciplinary learning rather than solely as a subject (Genesee et al., 2014). This methodology creates genuine learning scenarios where students build both academic competence and language proficiency, making it highly effective for English instruction.

Finally, it is worth mentioning that the relationship between ESL and CLIL has gained importance because both focus on improving language skills through substantive content (García-Sánchez & Garcés-Conejos Blitvich, 2014). In that sense, integrating cultural components in CLIL lessons increases student involvement, motivation, and intercultural awareness, making cultural learning a core part of acquiring both language and subject knowledge.

Explanation

The innovation project began by understanding the context of the school, students, and teachers while also exploring classroom learning environments. To gather this information, we conducted a survey involving various stakeholders within the institutions. The survey was a key part of the needs analysis, which is essential before creating a syllabus that aligns with institutional academic needs. According to Hutchison & Waters (1987), conducting a need analysis allows syllabus designers to identify both targets needs and learning needs, which is crucial to make instructional relevant. Similarly, Richards (2001) highlights that the needs analysis functions as a bridge between institutional goals and classroom practices, guaranteeing curricular coherence. Once the needs analysis was completed, the process moved into syllabus design. As Graves (2000) explains, syllabus design is not a static product but a dynamic process in which teachers select, sequence, and adapt content to fit the learning context.

The survey was completed by academic coordinator, English teacher, and science teachers. From the responses, we identify that while the sea levels units followed A logical sequence, the workbook use was often disconnected from the syllabus. Additionally, the teachers highlighted the benefits they observed from PBL and collaborative learning, noting how these approaches increased student reflection on real-world situations. However, they also pointed out challenges, particularly the limited time available for language classes due to the diverse range of subjects that students are required to complete.

As a second step, taking into consideration the needs analysis, we begin comparing the materials used in the current science class with the new course book that will be introduced next year for teaching

science in English. To organize the information, we create a matrix to visualize the connections between the topic in both coursebook, allowing us to identify areas of alignment and potential gaps. For instance. In first, second and third grade. They were many connections in terms of topics. After reviewing the themes and schools needs to integrate science into English classes, we decided to introduce the CLIL approach to combine content and language learning from two key reasons. First, CLIL is increasingly used in bilingual education settings, as it enhances both language proficiency and subject knowledge by teaching a subject through a foreign language. Second, the CLIL approach emphasizes communication and culture, which are as important as content, helping to connect real world situations with the curriculum.

Moreover, we needed a strong foundation to develop a syllabus then aligned with the requirements and goals of the innovative project. With this in mind, we choose a content-based approach. which ensured a strong connection between subject matter language development and cognitive skill. This approach supports the development of both lower and higher-order thinking skills as the course progresses.

The third step in this process was to reorganize the content to ensure a logical sequence of topic and cognitive skill development. We also connected the activities that were most aligned with the learning objectives, enhancing the flow and coherence of this science syllabus. In this way, we created a sequence that allows students to recognize content from their Spanish Science class and connect it with the new syllabus, which focuses on science content in English, while also improving their second language skills, particularly in communication.

After the creation of the syllabi, we designed lessons plans that followed the outline of the syllabus, including weekly learnings, aptitudes and activities based on PBL. Hamer (2007) emphasizes that lesson planning should integrate communicating goals with meaningful tasks to maximize students' engagement. Likewise, Kokotsaki et al. (2016) point out that PBL activities foster motivation, collaboration, and problem-solving skills when carefully integrate into lesson design. This ensured that our plans did not only cover scientific content but also encouraged authentic communication and higher order thinking.

The next step in the project involves piloting phase, where the connections between cyclical CBL and PBL were tested through the implementation of the lesson plans in a third-grade primary group and

private school. This study followed a qualitative, interpretive design, focusing on understanding classroom experiences through multiple data sources, including classroom observations, reflective journals, and student interviews. It also followed the design of an action research approach, as defined by Crawford, R. (2022), to implement an educational innovation study focused on enhancing teaching and learning through reflective practice. This group was selected based on its diversity, linguistic background, and openness to language through student centered methodology. This stage assessed the effectiveness of integrating content and language learning with project based and collaborative learning approaches in a real classroom setting, providing valuable insights for future implementations and improvements. Additionally, the data collected through classroom observations, reflected teachers' journal entries, and student interviews during the pilot phase was analyzed to identify any challenge and areas for further development.

Pedagogical and Methodological Impact of CLIL and PBL

This category focuses on the pedagogical methodological transformations that took place during the sessions. One of the most significant changes observed was the adoption of innovative and meaningful methodologies, particularly the usage of practical hands-on activities. For instance, students completed reflective journals throughout the process of observing plant growth. Students were tasked with closely monitoring the growth of their plants, documenting their care routines, and identifying signs that indicated a need for more or less sunlight, water, or air. They were encouraged to reflect on the outcomes of their actions, recognizing how environmental factors directly influenced the plant's health. In cases where essential resources like water or sunlight were lacking, the plants withered and eventually died, offering a tangible lesson in responsibility and the impact of attentive care.

The connection between the terms of growth, nutrients, and necessities was consistently present, as well structures as “my plant needs more water”, or “my plant needs sunlight, as I do”. The usage of real-life analogies and modeling provided students with concrete and engaging ways to relate to complex scientific content. These strategies allowed learners to move beyond passive absorption of information and instead participate actively in their education. As one student described, "we had almost never done that, but I think it's cool and not stressful" (interview, April 09, 2025, S1).

This student emphasized the refreshing nature of these approaches. As Gibbons (2002) and Glenn (2020) highlighted as a core benefit of content-based learning: using authentic, real-world tasks to foster both subject understanding and language development. The incorporation of real-life analogies and modeling not only made the content more relatable but also encouraged active participation in learning. The incorporation of real-life analogies and modeling not only made the content more relatable but also encouraged active participation in learning. Learners perceived these methods as enjoyable and low-pressure, facilitating a more thorough grasp of challenging scientific ideas.

Also, learner-focused instruction was another significant element of the project's approach. Students were motivated to take initiative in their learning through participatory activities, with their engagement and independence reflecting core principles of both CLIL and PBL. As noted by Snow (2010) and Benbellal (2019), CBI and content-based syllabi prioritize the integration of meaningful content with language learning, encouraging students to actively engage in constructing knowledge. To sum up, the student-centered approach fostered a deeper understanding of scientific concepts and promoted critical thinking and creativity, which are key outcomes targeted with CBI.

An additional essential aspect in this area was the educator's adaptability and reflective practice. The teacher consistently adapted lessons in response to student needs, interests, and prior knowledge. This reflects Vygotsky's (1978) theory of the Zone of Proximal Development, which highlights that learning occurs when support of scaffolding allows students to move from assisted performance to independent mastery. By integrating strategies such as word walls, sentence starters and visual aids, the teacher provided the necessary scaffolding to bridge the gap between students' linguistic limitations and their cognitive abilities.

The activity was proposed so that students could create a model of the cell, clearly label each organelle, and mention its function using analogy verbs (for example, "the wall protects the cell"). However, due to the complexity of the activity, I printed a guide with the verbs in bold, designed a repetition exercise to connect each verb with its corresponding organelle, and created a table with the students to denote, in a simple way, the differences between cells (teacher journal, March 21, 2025, entry #2). In that way, when students demonstrated familiarity with content, the teacher replaced a planned repetition exercise

with a deeper comparative task between animal and plant cells. This flexibility highlighted a dynamic and responsive pedagogy rooted in reflective practice.

Moreover, students' perception of English as a tool rather than a barrier played a vital role in the overall experience. Many expressed feeling safe and supported enough to ask questions when they encountered difficulties. This resonates with Krashen's (1982) Affective Filter Hypothesis, which argues that when students feel comfortable and motivated, their ability to acquire a second language improves significantly. Likewise, Dörnyei (2014) explains that motivation in second language learning is dynamic and increases when learners perceive progress and support from teachers. These findings demonstrate how CLIL can reduce anxiety and increase confidence when properly scaffolding. One student stated: "Me siento libre de preguntar lo que no entiendo" ["I feel free to ask what I don't understand"] (entrevista, 9 de abril de 2025, S1).

This excerpt shows the trust cultivated within the classroom environment among students and the teacher. English was not taught in isolation but integrated into the learning of science, giving it real communicative value. In that sense, and despite the positive reception, students encountered certain challenges throughout the implementation. With the analysis of the teacher journal, the teacher mentions: "El reto fue adaptar el material al nivel de inglés de los estudiantes… y dar instrucciones claras" ["The difficulty was adapting the material to the English level of students… and the clear instructions"] (teacher journal, March 21, 2025, entry #2).

Nevertheless, as students engaged with science through authentic material in English, they developed gradually subject-specific vocabulary and improved their ability to express their ideas. This was possible because students were able to connect prior vocabulary knowledge to comprehend the new content presented in English (Glenn, 2020). When adapting to learning content in English, some students felt overwhelmed by the constant use of the foreign language, especially during tasks that require oral production: "Los estudiantes se sintieron frustrados porque no entendían todas las palabras en inglés, y los mismos estudiantes seguían participando. Esto hizo que algunos se sintieran excluidos o distraídos" ["Students felt frustrated because they didn't understand all the English words, and the same students kept participating. This made some of them feel left out or distracted"] (journal entry 1, April 09, 2025, S2, own translation)

The teacher noted that some students were participating less due to language barriers. In context, CLIL goes beyond teaching content and language by incorporating cognition and culture. Ensuring that students can both access the material and engage with it cognitively links to the cognition dimension, where scaffolding enables the progression from lower-order to higher-order thinking skills. This suggests that the challenge of adapting materials is not a language-access issue, but a natural part of enacting CLIL's bases, where content, communication, cognition, and culture must be integrated to create meaningful learning experiences. There is the importance of continuing scaffolding, differentiation, and emotional support when implementing CLIL strategies. Additionally, the CLIL had an emotional component to learning as shown in an interview. One student mentioned: "Algunos contenidos fueron difíciles. Pensé que iba a ser complicado aprender, pero después de la sesión lo entendí, y al final me sentí interesado en el proceso" ["Some content was difficult. I thought it was going to be hard to learn, but after the session, I did understand it, and in the end, I felt interested in the process"] (interview, April 09, 2025, S2, own translation).

This suggests that students progressed from basic word recognition to constructing meaningful knowledge, and they became motivated to continue exploring scientific concepts in English, as described by Lasagabaster & Sierra (2010), who highlight the role of interest and motivation in the learning of content through a foreign language.

Moreover, the analysis of the reflective journals and the interviews conducted revealed a high degree of interest and enthusiasm among students when learning processes such as plant grow or the 3D cell model, which is consistent with Lasagabaster & Sierra's (2010) findings on the importance of engagement in CLIL environments. A student also mentioned: "Lo más difícil para mí ha sido acostumbrarme a aprender tanto inglés" ["The most difficult thing for me has been getting used to learning so much English"] (interview, April 09, 2025, S3, own translation). This illustrates the emotional weight of the process.

The teacher further observed that some learners required additional support, such as simplified explanations and visual aids. Nevertheless, the learning was evident. Students who initially doubted their abilities shared later: "I said I couldn't learn them, but I did", illustrating their resilience and increased self-efficacy. Likewise, motivation and engagement remained consistently high throughout

the intervention. Learners expressed genuine enthusiasm for the lessons, making spontaneous comments such as: “Me gustan. Creo que son chéveres” [“I like them. I think they’re cool”] (interview, April 09, 2025, S2, own translation).

This enthusiasm was further reinforced by the active methodologies implemented, which encouraged students to express themselves through play, drawing, movement, and collaborative work. These multimodal experiences catered to diverse learning styles, making the lessons both accessible and relevant.

Instructional Design and Teacher Adaptability in CLIL Contexts

Through the teacher's journal, we analyzed the adaptability of CLIL in this context (primary school). As we had mentioned, teacher adaptability plays a critical role here. While reviewing the material, we were able to identify when students demonstrate difficulties with the scientific vocabulary (predator, prey, habitat). The teacher introduced vocabulary activities such as word walls, visual organizers, or sentence starters to provide immediate language support. This aligns with Glenn’s (2020) conclusions that organized approaches, including step-by-step guidance and focused vocabulary exercises, enhance understanding and encourage analytical interaction with genuine resources.

Notably, students showed the capacity to apply what they learned in class to practical, real-life situations. Several shared that they had explained concepts such as the food pyramid or ecological relationships at home. This shows that beyond memorizing facts, students internalized and communicated what they learned. In this context, English became a tool not only for understanding but also as a medium for sharing scientific knowledge, reinforcing the long-term benefits of integrated instruction.

Limitations

One of the primary limitations of this study was the brevity of pilot implementations. The innovation was introduced and evaluated over three-week period, in which each week included two instructional sessions, one lasting 70 minutes and the other 35 minutes. This condensed timeframe restricted the opportunity to observe long term effects on student’s learning outcomes, engagement, and sustained integration of the proposed methodologies. Moreover, the short duration hindered the interactive refinement of the syllabus and instructional materials. Without sufficient time for revelation of feedback cycles, the findings predominately reflect initial reactions and short-term impacts rather than enduring

transformation in educational practice. Therefore, future research should consider extending the implementation period to facilitate deeper integration of the innovation and enable a more comprehensive assessment of its pedagogical effect over time.

Institutional Constraints and Cultural Resistance

In addition to temporal limitations, the institutional context presented significant challenges to the adaptation of innovation methodologies. The study was conducted within a school environment characterized by traditional structure. In addition, temporary limitations on the instruction, curriculum, and teacher center instructional practice. This cultural framework brough obstacles to the implementation of student-centered approaches such as PBL and CLIL.

Institutional resistance to pedagogical change influenced both the execution and outcome of the syllabus, classrooms, management practice, social rigid seating arrangement and external emphasis of discipline delayed the facilitation of group tasks and collaboration activities. During the observation period, opportunities for peer interactions were minimal, resulting in a disconnect between CLIL's communicative emphasis and PBL's collaborative learning objectives.

Although students demonstrated a willingness to engage and ask questions, the prevailing classroom norms did not support spontaneous dialogue or peer-to-peer learning. The expectations of passive behaviors, evidenced by absence of movement, contributed to low levels of engagement, and limited the potential for meaningful learning experience. These findings underscore the importance of aligning institutional culture with pedagogical innovations to ensure successful implementation and sustainability.

Resistance to change, both from educators and institutional norms, may have influenced the depth and authenticity of the innovation's integration into the syllabus. In particular, the emphasis following a book, standardized testing as quizzes and rigid subject boundaries limited opportunities for interdisciplinary collaboration and language immersion, core components of both PBL and CLIL.

Another remarkable limitation related to CLIL was the goal of connecting content, language, cognition, communication, and culture. However, after implementing this innovation, some limitations became evident due to the context. Before extending the syllabus with CLIL and PBL, the needs analysis revealed that students' level of English was low. Despite this, the textbook used to create the syllabus

required students to face the challenge of exploring new vocabulary, with a cognitive focus on building and applying it in simple structures such as the present simple and basic descriptions. Nevertheless, connecting the text with the students proved to be difficult. For instance, language use may be minimized to avoid discomfort, or collaborative tasks may be reduced to individual assignments to align with traditional assessment models.

CONCLUSIONS

The study offered two significant contributions: fostering active, learner-centered instruction, and illustrating how CLIL principles can guide curriculum and lesson development. Results showed that CLIL is successful when lessons incorporate learner-focused approaches, experiential activities, and scaffolding, supporting Mehisto et al. (2008), who claim that CLIL merges content, communication, cognition, and culture to create authentic learning experiences. Furthermore, CLIL enhanced both language skills and critical thinking, as students applied scientific knowledge to practical scenarios (Morton, 2020).

Another key contribution was showing how science classes can serve as meaningful contexts for language acquisition, connecting communication, culture, and subject matter. Likewise, highlighting terminology linked to scientific topics expanded students' vocabulary and deepened their comprehension. Finally, integrating CLIL with project-based approaches encouraged active participation and heightened student motivation.

In that sense, although challenges arose, a range of engaging activities proved essential for facilitating the learning process, while obstacles like language difficulties and adapting materials were identified. Therefore, the project highlighted the potential of content-based science instruction to enhance educational experiences.

Finally, it is necessary to mention that future studies could investigate the long-term impact on language development, extend implementation to other grade levels, and provide targeted teacher training in CLIL approaches. Overall, the project offers a practical model for combining science and English instruction in Colombian primary schools.

REFERENCES

Aksela, M., & Haatainen, O. (2022). The key characteristics of project-based learning: How teachers implement projects in K-12 science education. Disciplinary and Interdisciplinary Science Education Research, 4(2), 1–18. https://helda.helsinki.fi/bitstream/handle/10138/341788/s43031_021_00042_x.pdf

Bell, S. (2010). Project-based learning for the 21st century: Skills for the future. The Clearing House, 83(2), 39–43. https://doi.org/10.1080/00098650903505415

Benbellal, A. (2019). Cotation of type A or type B, that is the question: A critical examination of product-oriented and process-oriented syllabuses in foreign language learning and teaching. Journal of Studies in Language, Culture and Society, 2(2), 121–137.

Cenoz, J., Genesee, F., & Gorter, D. (2014). Critical analysis of CLIL: Taking stock and looking forward. Applied Linguistics, 35(3), 243–262. https://doi.org/10.1093/applin/amt011

Chaya, P., & Inpin, B. (2020). Effects of integrating movie-based mobile learning instruction for enhancing Thai university students' speaking skills and intercultural communicative competence. English Language Teaching, 13(7), 27–37. https://doi.org/10.5539/elt.v13n7p27

Coyle, D., Hood, P., & Marsh, D. (2010). CLIL: Content and language integrated learning (1st ed.). Cambridge University Press.}

Crawford, R. (2022). Action research as evidence-based practice: enhancing explicit teaching and learning through critical reflection and collegial peer observation. *Australian Journal of Teacher Education*, *47*(12), 53-75. https://doi.org/10.14221/1835-517X.6065

Dalton-Puffer, C. (2011). Content-and-language integrated learning: From practice to principles? Annual Review of Applied Linguistics, 31, 182–204. https://doi.org/10.1017/S0267190511000092

Fragoulis, L. (2009). Project-based learning in the teaching of English as a foreign language in Greek primary schools: From theory to practice. English Language Teaching, 2(3), 113–119. https://doi.org/10.5539/elt.v2n3p113

Gibbons, P. (2002). Scaffolding language, scaffolding learning (2nd ed.). Heinemann.

Graves, K. (2000). Designing language courses: A guide for teachers. Heinle & Heinle.

Hempel-Jorgensen, A. (2015). Working-class girls and child-centred pedagogy: What are the implications for developing socially just pedagogy? International Studies in Sociology of Education, 25(2), 132–149. https://doi.org/10.1080/09620214.2015.1045010

Hutchinson, T., & Waters, A. (1987). English for specific purposes: A learning-centred approach. Cambridge University Press.

Jalilzadeh, K., & Tahmasebi, A. (2014). Content-based syllabus. European Scientific Journal, 10(10), 223–233. https://eujournal.org/index.php/esj/article/view/4093

Kean, A. C., & Kwe, N. M. (2014). Meaningful learning in the teaching of culture: The project-based learning approach. Journal of Education and Training Studies, 2(2), 189–197. http://jets.redfame.com

Kokotsaki, D., Menzies, V., & Wiggins, A. (2016). Project-based learning: A review of the literature. Improving Schools, 19(3), 267–277. https://doi.org/10.1177/1365480216659733

Krashen, S. D. (1982). Principles and practice in second language acquisition. Pergamon Press.

Lasagabaster, D., & Sierra, J. (2010). Immersion and CLIL in English: More differences than similarities. ELT Journal, 64(4), 367–375. https://doi.org/10.1093/elt/ccp082

Mariño, C. (2014). Towards implementing CLIL (Content and Language Integrated Learning) at CBS (Tunja, Colombia). Colombian Applied Linguistics Journal, 16(2), 151–160. http://www.scielo.org.co/scielo.php?pid=S0123-46412014000200003&script=sci_arttext

Martínez, M., & Gutiérrez, J. (2015). L1 use, lexical richness, accuracy, and syntactic complexity in the oral production of CLIL and non-CLIL learners of English. Atlantis, 37(2), 175–197.

Mehisto, P., Marsh, D., & Frigols, M. J. (2008). Uncovering CLIL: Content and language integrated learning in bilingual and multilingual education. Macmillan Education.

Ministerio de Educación Nacional. (2004). Programa Nacional de Bilingüismo: Colombia Very Well! Ministerio de Educación Nacional. https://www.mineducacion.gov.co

Morton, T. (2020). Funciones del discurso cognitivo: Un puente entre el contenido, la alfabetización y el lenguaje para la enseñanza y la evaluación en CLIL. Revista CLIL de Innovación e Investigación en Educación Plurilingüe y Pluricultural, 3(1), 7–17.

Núñez, I. (2007). Del diseño curricular al diseño syllabus: Las diferentes etapas para diseñar un programa. Academia.edu. https://www.academia.edu/18203260/Nunez_y_bodegas_irma_dolores_1_2

Snow, C. (2016). Research in second language teaching and learning (Vol. 3). Routledge.

Tao, L., Lei, Z., & Yan, M. (2023). A study of the impact of project-based learning on student learning effects: A meta-analysis study. Frontiers in Psychology, 14, 1202728. https://doi.org/10.3389/fpsyg.2023.1202728

Uccelli, P. (n.d.). The challenge of academic language. ResearchGate. https://www.researchgate.net/publication/258844877_The_Challenge_of_Academic_Language

Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Harvard University Press.

Zhang, W., Lu, M., & Yang, P. (2023). An empirical study about the impact of project-based learning on reading literacy of primary students in a blended learning environment. Psychology in the Schools, 60(12), 4930–4945. https://doi.org/10.1002/pits.22949