

Implementation of Content and Language Integrated Learning Methodological Guide to Improve Learning of Science in English

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ABSTRACT

This research reviews and applies Content and Language Integrated Learning (CLIL) in the framework of teaching sciences in English as a Foreign Language (EFL). It encompasses the need to tailor English language acquisition to the matters and concepts of sciences. The scope was 114 seventh-grade students of the bilingual program at Centro Educativo Internacional La Moderna. The research aims to enhance language acquisition and boost science comprehension through an integrated approach. The outcomes score favorable influence of the CLIL implementation on students' academic achievements, attitudes, and enthusiasm. The findings substantiate the advantages of integrating language and content in promoting language skills while facilitating the grasping of intricate scientific notions. The study contributes to knowledge of the practical deployment of CLIL techniques and their implications on teaching science. Besides, elucidates the potential of CLIL as a pedagogical instrument to enrich language proficiency and science comprehension concurrently. Thus, fosters a holistic educational experience for science learners in EFL educational programs.

Keywords: *CLIL; EFL; science education; pedagogy*

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Implementación de Guía Metodológica de Aprendizaje Integrado de Contenidos y Lenguajes para Mejorar el Aprendizaje de las Ciencias en Inglés

RESUMEN

El estudio revisa y aplica el Aprendizaje Integrado de Contenidos y Lenguas Extranjeras (AICLE) en el ámbito de la enseñanza de ciencias impartidas en idioma inglés como lengua extranjera (EFL). Aborda la necesidad de adaptar el aprendizaje de otra lengua a los dominios específicos de ciencias. Se tomaron 114 estudiantes de séptimo nivel que participan en el programa bilingüe del Centro Educativo Internacional La Moderna. El objetivo de la investigación es mejorar el manejo del idioma y la comprensión de los principios científicos a través de un enfoque integrado. Los resultados demuestran favorable la influencia del marco metodológico AICLE en los logros académicos, las actitudes y el entusiasmo de los estudiantes. Los resultados corroboran las ventajas de integrar lenguaje y contenido para fomentar destrezas lingüísticas, y facilitar la comprensión de nociones científicas complejas. Este estudio contribuye al acervo de conocimientos sobre la aplicación práctica de las técnicas AICLE y sus implicaciones para la enseñanza de ciencias. Además, denota el potencial de AICLE como instrumento pedagógico para mejorar la competencia lingüística y comprensión de contenidos de asignatura al mismo tiempo. Así, fomenta una experiencia educativa holística estudiantes de ciencias en programas educativos bilingües EFL.

Palabras clave: AICLE; EFL; enseñanza de las ciencias; pedagogía

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INTRODUCTION

Teaching the English language has undergone significant changes in recent years, demanding improvements in traditional teaching methods. It is crucial to propose the application of a new method that not only enhances linguistic skills but also focuses on language development in specific subjects. In Ecuador, the Ministry of Education has provided instructions to incorporate Content and Language Integrated Learning (CLIL) for teaching natural sciences. CLIL is a teaching approach that emerged in Europe during the 1990s, developed collaboratively by educational administrators, researchers, and practitioners (Marsh, 2002). This research aims to explore the implementation and effectiveness of CLIL in the context of teaching natural sciences, aligning with the need to adapt English language instruction to subject-specific content.

By examining the principles and practices of CLIL, this study aims to enhance language learning outcomes and facilitate a deeper understanding of scientific concepts through an integrated approach. The Ecuadorian Ministry of Education recognizes the importance of integrating language and subject matter to provide students with a comprehensive education. With the application of CLIL in the teaching of natural sciences, students can develop both their English language proficiency and their understanding of scientific concepts. This integrated approach promotes active engagement, critical thinking, and language use in authentic contexts, fostering a more holistic learning experience.

The specific instructions provided by the Ecuadorian Minister of Education emphasize the implementation of CLIL in science classrooms. Teachers are encouraged to integrate English language instruction with the teaching of natural sciences, ensuring that students actively use English to comprehend and communicate scientific ideas. The instructions also stress the importance of selecting appropriate materials and resources that support CLIL principles, such as textbooks, articles, videos, and hands-on experiments that facilitate language learning and scientific exploration.

Moreover, the Minister of Education encourages teachers to create an inclusive and supportive classroom environment that promotes collaboration and interaction among students. Cooperative learning strategies, group discussions, and project-based activities are recommended to enhance language acquisition and conceptual understanding. Teachers are encouraged to provide clear language

objectives and scaffold students' language development by providing necessary vocabulary, sentence frames, and explicit language instruction.

In the present research work, the authors will try to give a general vision of the pedagogical problems involved in the implementation of a bilingual program that includes the subject of natural sciences taught only and exclusively in English, specifically for the students of the seventh grade of Centro Educativo Internacional La Moderna. Within this program of bilingualism which has been applied since its foundation, from second grade to tenth grade of elementary school, Centro Educativo La Moderna proposes the teaching of different subjects in a foreign language (English) from an early age, in which the area of science stands out.

In spite of the fact that the process of bilingual teaching of natural sciences has resulted in an enriching and innovative experience in the institution, some particular weaknesses have been found in it. One of the main facts making struggles to carry out the classes effectively is that some of the teachers assigned to teach the subjects are not specialized in the disciplinary knowledge about a particular science, likewise, the majority of them are English as Foreign Language (EFL) teachers. Consequently, teachers often are limited to the repetition and memorization of vocabulary in a foreign language, instead of focusing on the sciences learning. However, this problem is not specific or unique to the educational unit, as it is constantly reflected in different private institutions with similar programs around the country, where, in general, the mastery of the foreign language prevails over the knowledge of science, due to the lack of specialization of teachers in the specific area of study, since they do not have a university center within the country that grants them a degree as teachers in specific subjects as in this case the subject of natural sciences in English.

This may be the result of the belief that a "bilingual" program implies only the use of English, thus excluding what is relevant and essential to achieving an effective teaching-learning process, which is to have absolute mastery of the subject to be taught.

Taking as a starting point what is expected by the Ministry of National Education and the needs of the educational unit La Moderna to provide an education with an emphasis in English, it has been evidenced in the diagnosis of the area made at the beginning of the year 2022 that children have the ability to learn and acquire knowledge, however, there is a great gap to overcome between the elementary content of

the subject and the inappropriate manner in which in previous years the subjects were taken; therefore, a detailed description of this process in the institution will be made, thus contributing to the strengthening of the bilingualism program.

Unfortunately, in Centro Educativo La Moderna, traditional methods of teaching science were applied before this investigation, they relied on rote memorization, repetitive worksheets, and passive learning, which was both boring and meaningless for students. These methods focused primarily on delivering information without actively engaging students in the learning process. Students felt disconnected from the subject matter and failed to see the relevance and practical applications of scientific concepts. The lack of hands-on activities, critical thinking exercises, and opportunities for experimentation diminished students' interest and hindered their ability to develop a deep understanding of scientific principles. The application of those traditional methods limited creativity and discouraged students from asking questions and exploring their own curiosity. As a result, students perceived science as a dull and disconnected subject rather than a fascinating and essential field of study.

There are a number of drawbacks to bilingual education that make its implementation delayed or inadequate. There are a considerable number of disadvantages, or poor results, belonging to the students in centers where there is apparently good preparation and widespread knowledge of how the bilingual program needs to be carried out. On the one hand, there is a lack of specific knowledge and methodological preparation; the teacher not only requires outstanding linguistic competence but also a certain mastery of the specific subject to be taught. Teachers complain that there are very few initial and in-service training programs based on methods of teaching a subject in a language other than the one normally used. Private schools have didactic material adapted to this type of class, the problem lies in the teacher's preparation on that specific subject and how to make it work through CLIL (Content and Language Integrated Learning), which meets the objectives of the foreign language in question and the subjects of the curriculum. That is why the present research work exposes the problems found in the education system, and it's a guide with possible solutions focused on the study of natural sciences in seventh-grade students

Learning Science encompasses the study of various scientific disciplines and their integration into educational frameworks. In recent years, there has been growing recognition of the importance of incorporating science education within the broader context of language learning, particularly in the teaching of English as a second language. The literature review aims to explore the intersection of science education and language learning, and the role of science in learning English. Science encompasses a vast array of disciplines, including biology, chemistry, physics, geology, astronomy, and environmental science, among others. It involves the systematic study of the natural world, employing empirical methods, observation, experimentation, and analysis to generate knowledge and understanding. Science provides a framework for investigating and explaining phenomena, exploring cause-and-effect relationships, and developing models and theories to explain natural processes (National Research Council, 2012).

The primary purposes of teaching science extend beyond the mere transmission of factual information. Science education aims to cultivate scientific literacy, critical thinking, problem-solving skills, and an appreciation for the natural world. By engaging students in scientific inquiry, experimentation, and exploration, educators strive to foster a deep understanding of scientific concepts and the ability to apply them in real-life contexts. Furthermore, science education seeks to nurture curiosity, develop scientific reasoning, and promote the scientific method as a reliable means of investigating and understanding the world (Bybee, 2014). Further, science education plays a crucial role in equipping individuals with the knowledge and skills necessary to navigate an increasingly complex and technologically advanced society. It enables individuals to make informed decisions, critically evaluate scientific claims and evidence, and engage in societal issues with scientific implications. Science literacy empowers individuals to understand and appreciate scientific advancements, contributing to a scientifically informed citizenry capable of addressing global challenges such as climate change, public health, and sustainable development (American Association for the Advancement of Science, 1993).

Integrating science education with language learning offers numerous benefits for English language learners. By incorporating scientific content into English language instruction, students are exposed to authentic language use within a meaningful and engaging context. Science provides a rich and diverse vocabulary, scientific discourse, and opportunities for language practice through reading, writing,

listening, and speaking activities. Moreover, learning scientific concepts in English promotes language acquisition by providing students with opportunities to use the language to explore, explain, and communicate scientific ideas (Snow, 2010).

Within educational institutions, science is typically classified into distinct disciplines, each with its own curriculum, content, and pedagogical approaches. In primary and secondary schools, science is often divided into broad categories such as biology, chemistry, and physics, allowing students to delve deeper into specific scientific domains as they progress through their education. At higher education levels, science may be further specialized into sub-disciplines, reflecting the depth and complexity of scientific knowledge. This classification facilitates a structured and progressive learning experience, enabling students to develop a comprehensive understanding of scientific principles (National Science Teachers Association, 2020). In Centro Educativo La Moderna, the subject of science is taught since 2nd grade, so students face the challenge of studying a subject in a second language at an early stage. Taking into consideration that the school is endorsed as a bilingual school, the level of English needed is a requirement, but unfortunately, every single year a lot of new students with poor knowledge of English are accepted, making the conditions to achieve the goal more difficult for the teacher.

The existing literature on the implementation of Content and Language Integrated Learning (CLIL) in the context of teaching sciences in English as a Foreign Language (EFL) comprises the effectiveness of CLIL methodologies to enhance students' learning outcomes, particularly in the field of science education. By analyzing relevant studies and scholarly works, this literature review will shed light on the theoretical foundations, instructional practices, and outcomes associated with CLIL in the EFL context. "CLIL has emerged as a prominent approach to language education, emphasizing the integration of content and language learning to promote meaningful and authentic language use" (Lorenzo, Lasagabaster, & García, 2021). This approach has gained considerable attention in recent years, as educators seek innovative ways to enhance language proficiency and subject knowledge simultaneously (Dalton-Puffer, 2011) By immersing students in content-rich learning experiences conducted in a target language, CLIL aims to develop both language skills and disciplinary understanding (Lasagabaster & Doiz, 2017). In the specific context of EFL science education, CLIL offers a promising path for promoting language development and scientific literacy among students. Integrating the teaching of

science concepts with English language instruction allows students to acquire scientific knowledge while simultaneously improving their English language proficiency (Wang, 2013). However, the effective integration of CLIL in science classrooms necessitates meticulous consideration of several factors. These include thoughtful curriculum design, comprehensive teacher training, effective assessment practices, and the careful selection of suitable materials and resources (Doiz, Lasagabaster, & Sierra, 2014).

The theoretical foundations of CLIL reveal an educational approach that seamlessly integrates the teaching of content subjects with the acquisition of a second or foreign language. At its core, CLIL operates under the fundamental belief that language learning is best achieved through meaningful engagement with subject-specific content. Drawing upon theories of language acquisition, such as Vygotsky's sociocultural theory and Cummins' linguistic interdependence hypothesis, CLIL emphasizes the importance of meaningful language use and contextualized learning experiences (Coyle, Hood, & Marsh, 2010; Cummins, 2008; Vygotsky, 1978). Vygotsky posits that language serves not only as a means of communication but also as a tool for cognitive development. The roots of CLIL can be traced back to the early 20th century when bilingual education models began to gain recognition as effective approaches for language learning. However, it was in the 1990s that CLIL emerged as a distinct and influential pedagogical approach (Marsh, 2002). CLIL has gained significant attention and popularity in educational settings worldwide due to its ability to enhance language proficiency, facilitate the acquisition of content knowledge, and foster cross-cultural understanding (Dalton-Puffer, Nikula, & Smit, 2010). This perspective aligns with CLIL's focus on providing students with authentic language usage in meaningful contexts, enabling them to construct knowledge and establish connections between language and subject matter (Dalton-Puffer, 2007), as it's happening in science classes all over bilingual program focus in English as a foreign language.

Assessment practices in CLIL encompass both content and language objectives. Formative assessments are employed to monitor students' progress and provide timely feedback, enabling instructors to tailor instruction to individual needs (Dafouz & Guerrini, 2022). On the other hand, summative assessments evaluate overall performance and achievement in both content knowledge and language proficiency. It is crucial that assessments in CLIL align with the integrated nature of instruction and reflect authentic

language usage in relevant tasks and contexts (Hidalgo-McCabe & Sancho Guinda, 2019). Thus, CLIL is an educational approach that seamlessly integrates content and language learning, aiming to provide students with meaningful and authentic language experiences.

Teachers' pedagogical content knowledge and language competence play a vital role in delivering effective CLIL instruction. Marsh (2002) emphasized the importance of teachers' content knowledge and their ability to make connections between language and science concepts. Furthermore, professional development programs that focus on CLIL methodologies and strategies have been shown to enhance teachers' instructional practices (Coyle, 2013). Moreover, providing appropriate instructional materials, curriculum support, and assessment strategies that are specifically designed for the CLIL context plays a pivotal role in ensuring effective implementation (Coyle, 2010). Overall, the implementation of CLIL in EFL science classrooms requires a multifaceted approach that involves curriculum design, teacher training, assessment, and the selection of appropriate materials and resources, which are provided by CLIL for improving science learning in EFL students and preparing them for success in a global economy (Doiz et al., 2014).

BODY

Considering the complexity and multifaceted nature of the research topic, a mixed-methods approach emerges as an appropriate paradigm. By combining quantitative and qualitative methods, researchers can gain a more comprehensive understanding of the phenomenon under investigation. Quantitative methods, such as surveys and pre and post-tests, can provide numerical data on participants' attitudes, knowledge, and achievement, allowing for statistical analysis and generalizability of findings. On the other hand, qualitative methods, including interviews, observations, and document analysis, can delve into the rich contextual details, capturing the nuanced experiences, beliefs, and practices of educators and learners in science education and language learning settings. The integration of these approaches can provide a more holistic perspective, allowing researchers to explore both the breadth and depth of the research topic, uncovering patterns, and generating in-depth insights. By adopting a mixed-methods paradigm, this research project can leverage the strengths of both quantitative and qualitative methods, leading to a comprehensive and robust exploration of the intersection of science education and language learning.

METHODOLOGY

The purpose of this research study was to investigate the effectiveness of implementing a CLIL methodological guide in improving the learning outcomes of seventh-grade EFL students in the field of science. In line with the research objectives, a descriptive survey research design was adopted to provide a comprehensive description and analysis of the existing conditions, yielding valid and reliable results in education research (Babbie, 2019). Both qualitative and quantitative data were collected and analyzed to gain a deeper understanding of the impact of the CLIL approach on student learning. Additionally, a theoretical framework was developed through a thorough review of relevant literature on CLIL implementation and its impact on science education for EFL students in seventh grade. This theoretical framework served as a foundation for identifying the main and supporting points, lending relevance and coherence to this research article.

Best and Kahn (2006) observe that a descriptive survey is a research design which aims at describing, recording, analyzing, and interpreting existing conditions that yield valid and reliable education research results. Thus, the research modality selected for this study is the descriptive method with a qualitative and quantitative analysis. Additionally, it was important to create the theoretical framework (documentary investigation into the theories of the writers) concerning the implementation of a CLIL methodological guide as an independent variable and the improvement of learning of sciences in EFL students of seventh grade as a dependent variable. By doing this, the researcher assisted in the development of the major and supporting points that gave this research article pertinence (Creswell, 2012).

In terms of qualitative analysis, qualitative research approaches were employed to explore the ideas, perceptions, opinions, and beliefs of the participants, acknowledging that not all aspects of the research can be quantified (Merriam, 2019). According to Creswell (2013), qualitative research is an income to understand meanings assigned to social human problems. In addition, the research applied triangulation, which refers to the combination of methods or sources of data in a single study. It is also often thought of as a way of checking out insights gleaned from different informants or sources of data (Taylor Bogdan, & DeVault, 2016). Triangulation, as suggested by Denzin and Lincoln (2018), was employed in this study, referring to the use of multiple methods or sources of data to validate and enhance the

credibility of the findings (Patton, 2015). By utilizing data triangulation, which involved surveys, pre and post-tests, and checklists, the researchers aimed to ensure the validity and reliability of the study findings.

Instruments

The instruments applied in this research were a survey, pre, and post-test. Before implementing the methodological guide, the instruments were piloted with students and modified. In the end, we took a survey to the teachers to know their opinions about the proposal.

Population

The population of students in Centro Educativo La Moderna is approximately 1900 students but for this study, the population sample consists of 114 seventh-grade students enrolled in the bilingual program seventh grade, in four parallels (A, B, C, and D). A purposive sampling technique has been used to select a representative sample of students who have been exposed to the CLIL methodological guide. The sample included students who had completed the science curriculum following the CLIL approach. The selection criteria will include students' English language proficiency levels, academic performance, and availability to participate in the research.

Research Questions / Answers

Research Question #1: To what extent will the application of CLIL improve language skills and scientific understanding?

The study employed CLIL methodology in science classrooms, where teachers integrated English language instruction with the teaching of natural sciences. A comprehensive analysis of the collected data was conducted to determine the impact of CLIL on language skills and scientific understanding.

The results showed that the implementation of CLIL positively influenced language skills, as students actively used English to comprehend and communicate scientific ideas. Language objectives were clearly defined, and teachers provided the necessary support for language development through vocabulary, sentence frames, and explicit language instruction. Moreover, the study revealed that CLIL effectively enhanced students' understanding of scientific concepts. By learning science in English, students were able to apply their language skills in authentic contexts, promoting active engagement and

critical thinking. The integrated approach fostered a more holistic learning experience, bridging the gap between language and subject matter.

Research Question #2: What challenges and weaknesses are faced in implementing CLIL in science classrooms?

While the study highlighted the benefits of CLIL, it also identified some challenges and weaknesses in its implementation. One of the main challenges was the lack of specialization of teachers in both English language instruction and disciplinary knowledge about natural sciences. Many teachers were English as Foreign Language (EFL) instructors, limiting their ability to focus on science learning rather than mere vocabulary memorization. The study also found that institutions lacked adequate training and resources for CLIL implementation. Teachers required specific training in teaching subjects in a language other than the one normally used, and there was a need for suitable didactic materials tailored to CLIL principles.

Research Question #3: What are students' perspectives toward the implementation of CLIL in science classes?

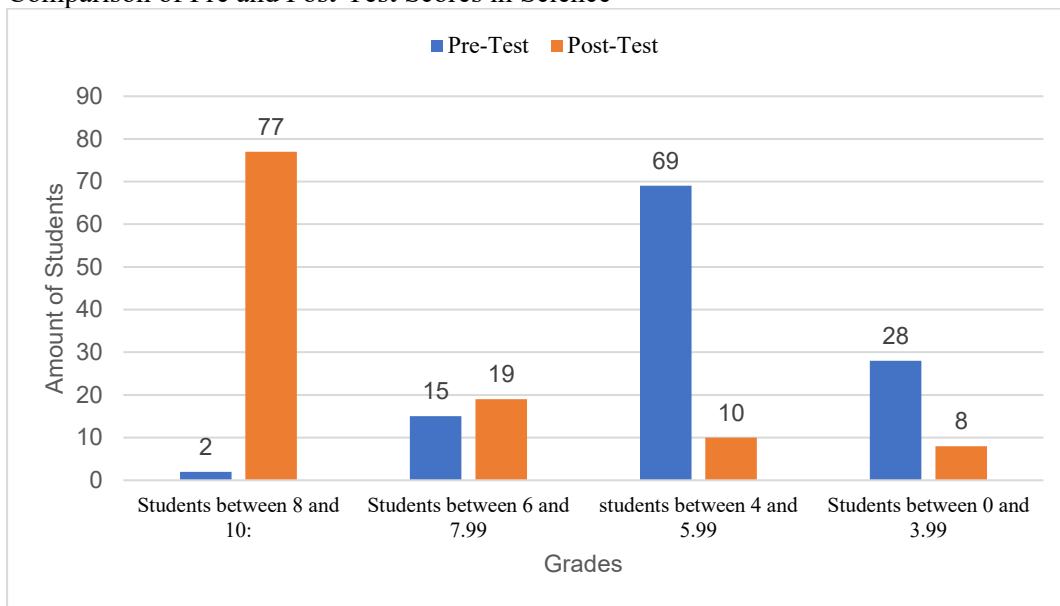
To gauge students' perspectives towards CLIL implementation, a post-survey was conducted at the end of the study. The results of the survey demonstrated positive feedback from the students. They acknowledged the benefits of integrating language and science, stating that it enhanced their language proficiency and scientific understanding. Students felt engaged and motivated, appreciating the opportunity to apply English in real-life scientific contexts.

RESULTS

▪ Effectiveness of CLIL Approach in Enhancing Learning Outcomes:

To assess the effectiveness of the CLIL methodological guide in improving learning outcomes, both quantitative and qualitative data were collected. Pre and post-tests were conducted to measure students' performance in science before and after the implementation of CLIL. Additionally, qualitative data, such as classroom observations and teacher feedback, provided valuable insights into the impact of CLIL on students' academic progress.

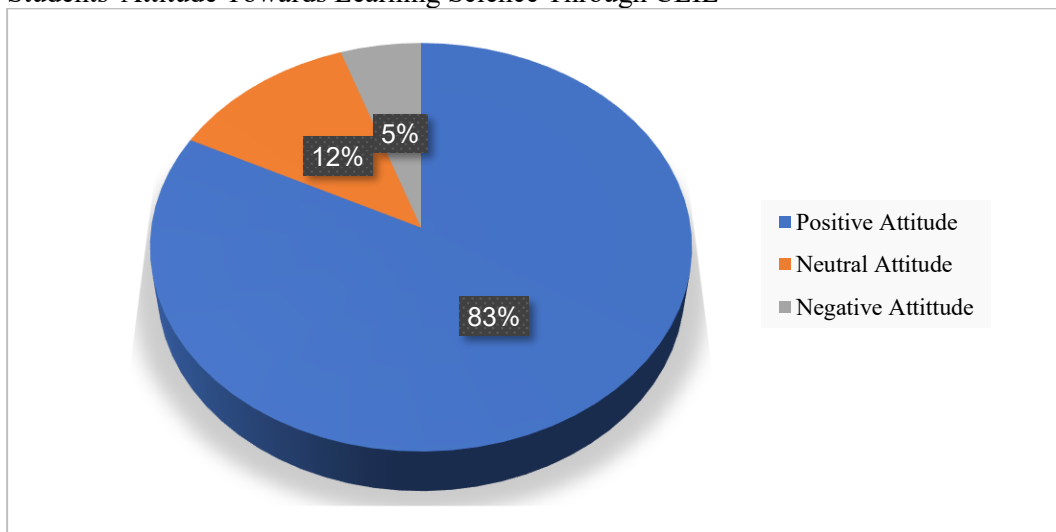
Chart 1
Comparison of Pre and Post-Test Scores in Science



The scores of pre and post-test scores in science show a significant improvement in student's performance after the implementation of the CLIL approach. The post-test scores indicate a higher level of understanding and knowledge of scientific concepts, highlighting the positive impact of CLIL on learning outcomes.

▪ **Impact on Students' Attitudes and Motivation:**

Chart 2
Students' Attitude Towards Learning Science Through CLIL



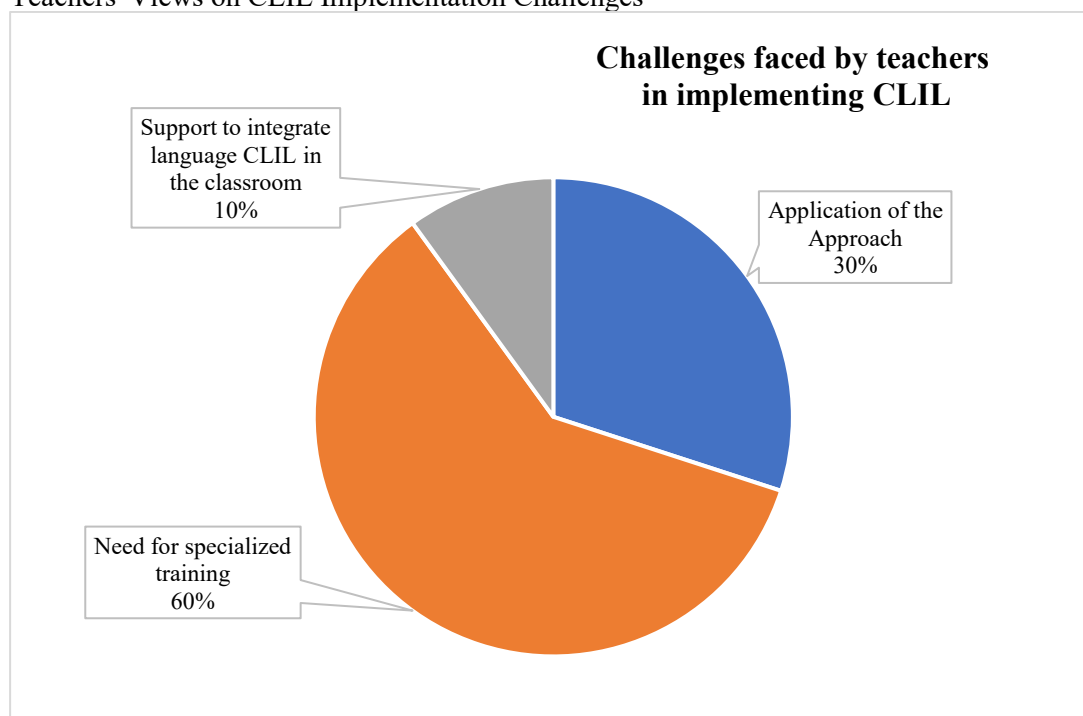
To gauge the impact of CLIL on students' attitudes and motivation toward learning science, surveys and interviews were conducted. Students were asked about their engagement, interest, and overall perception of learning science in English through the CLIL approach. So, the results in the attitude survey toward

learning science through CLIL stand for a positive attitude. Significant students indicated increased interest and enthusiasm for science. The interactive and engaging nature of CLIL lessons contributed to a more positive learning experience, fostering a deeper connection to scientific concepts.

▪ **Teachers' Perspectives on CLIL Implementation:**

To understand the challenges and experiences of teachers in implementing CLIL, interviews, and focus group discussions were conducted. Teachers shared their insights on the benefits and difficulties of adopting the CLIL methodological guide in science classrooms.

Chart 3
Teachers' Views on CLIL Implementation Challenges



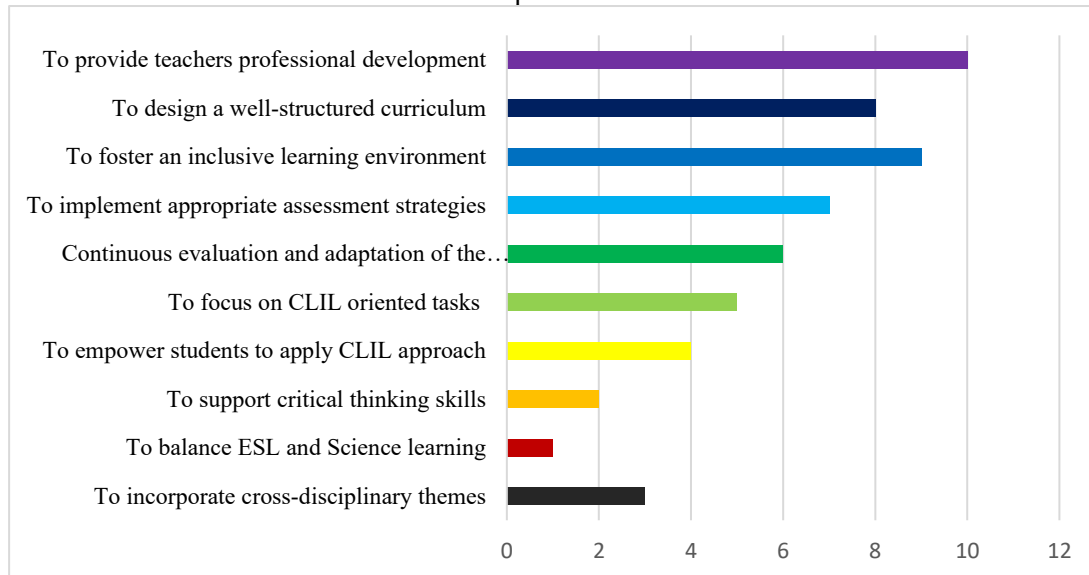
Results outline as well the challenges faced by teachers implementing CLIL. While many teachers recognized the potential benefits of the approach, they also acknowledged the need for specialized training and support to effectively integrate language instruction with subject-specific content. Professional development opportunities were identified as essential for enhancing teachers' expertise in both language and science instruction.

- **Recommendations for Successful CLIL Implementation:**

Based on the research findings and insights from both students and teachers, the study offers valuable recommendations for successful CLIL implementation in science classrooms.

Chart 4

Recommendations for Successful CLIL Implementation



Summarizing the key recommendations for successful CLIL implementation. These include providing teachers with professional development, designing a well-structured curriculum, fostering an inclusive learning environment, implementing appropriate assessment strategies, and continuously evaluating and adapting the CLIL approach. These recommendations serve as a guide for educators and policymakers to enhance the effectiveness of CLIL in promoting language proficiency and science learning simultaneously.

- **Positive Results for Students:**

The implementation of the CLIL methodological guide yielded significant positive outcomes for students at Centro Educativo Internacional La Moderna. The comparison of pre and post-test scores, as depicted in Chart 1, clearly indicates a remarkable enhancement in students' learning outcomes. This improvement reflects a deeper understanding and mastery of scientific concepts, showcasing the effectiveness of the CLIL approach in elevating academic achievements. Moreover, the impact of CLIL extended beyond academic performance. Chart 2 portrays the students' attitude towards learning science through CLIL, revealing a surge in enthusiasm and engagement. A substantial portion of students expressed heightened interest and a positive disposition towards science education. This shift in attitude

can be attributed to the interactive and engaging nature of CLIL lessons, which fostered a more profound connection to scientific principles and concepts. The integration of language learning with subject-specific content enriched students' learning experiences, making science more relatable and enjoyable.

- **Positive Results for Teachers:**

Teachers played a pivotal role in the successful implementation of CLIL in science classrooms. Despite the challenges highlighted in Chart 3, teachers reported several positive outcomes resulting from their involvement in the CLIL approach. The opportunity to merge language instruction with scientific content invigorated their teaching practices. The teachers' perspectives underscored the transformative potential of CLIL, as it encouraged innovative instructional methods and enriched their professional growth.

Furthermore, the CLIL methodological guide empowered teachers to bridge the gap between language and science, enabling them to facilitate more holistic and comprehensive learning experiences. While acknowledging the need for specialized training, teachers expressed a sense of accomplishment in fostering students' dual development in language proficiency and scientific understanding. This positive impact on teachers resonated throughout the institution, creating an environment conducive to collaborative and effective teaching methodologies.

- **Positive Impact for the Institution:**

The implementation of the CLIL approach yielded positive outcomes for Centro Educativo Internacional La Moderna as an institution committed to holistic education. The research findings showcased in Chart 4 provide valuable recommendations for successful CLIL implementation, enhancing the institution's overall educational quality. By prioritizing teacher professional development, designing a well-structured curriculum, and fostering an inclusive learning environment, the institution ensures a comprehensive approach to education that aligns with the demands of a globalized world. Furthermore, the positive impact of CLIL resonated within the institution's reputation. The successful integration of the CLIL approach positioned the institution as a pioneer in innovative and effective teaching methods. This recognition not only attracts students seeking a holistic and enriched learning experience but also contributes to the institution's prominence in the education sector. As a result, the institution's

commitment to enhancing language proficiency and science education through CLIL serves as a model for other educational institutions seeking to enrich their curricula and elevate student outcomes.

Overall, the results of the study highlight the positive impact of the CLIL methodological guide on students' learning outcomes, attitudes, and motivation toward science education in English. The data visualization through charts provides a clear and concise representation of the research findings, emphasizing the significance of the CLIL approach in enhancing science education in the context of Centro Educativo Internacional La Moderna. By incorporating CLIL into science classrooms and addressing the challenges through the recommended strategies, educators can create a more immersive and enriching learning experience, equipping students with the necessary skills to succeed in an increasingly interconnected and globalized world. Overall, the positive results observed in students' academic achievements, teachers' professional growth, and the institution's reputation underscore the significance of the CLIL methodological guide at Centro Educativo Internacional La Moderna. The data visualization provided through charts emphasizes the transformative potential of CLIL in enhancing science education within the institution. By embracing CLIL and leveraging its benefits, the institution has demonstrated a commitment to nurturing well-rounded individuals equipped with the skills and knowledge needed to thrive in an interconnected global society.

DISCUSSION

The study's results indicate that the application of CLIL in science classrooms has significant potential to improve language skills and scientific understanding. By combining language learning with subject-specific content, students not only improved their English proficiency but also developed a deeper comprehension of scientific concepts.

The theoretical foundations of CLIL highlight its role as an approach that integrates content and language learning. By engaging students in content-rich learning experiences conducted in a target language, CLIL aims to develop both language skills and disciplinary understanding. Vygotsky's sociocultural theory and Cummins' linguistic interdependence hypothesis form the basis of CLIL's emphasis on meaningful language use and contextualized learning experiences. As such, CLIL has gained attention for its ability to enhance language proficiency, facilitate content knowledge acquisition, and foster cross-cultural understanding. Science education plays a vital role in promoting scientific

literacy, critical thinking, and problem-solving skills. By integrating science education with language learning, students are exposed to authentic language use within the context of scientific exploration. Moreover, integrating science concepts into English language instruction allows students to acquire scientific knowledge while simultaneously improving their language proficiency.

However, the study also revealed the challenges faced in implementing CLIL, particularly related to teacher specialization and the availability of suitable resources. To address these challenges, it is recommended to provide comprehensive training programs for teachers to effectively deliver CLIL instruction. Additionally, educational institutions should invest in the development of appropriate didactic materials and resources aligned with CLIL principles.

The positive feedback from students in the post-survey underscores the effectiveness of CLIL in promoting active engagement and motivation. Students' perspectives towards the integration of language and science were highly favorable, emphasizing the practicality and relevance of using English in scientific contexts.

LIMITATIONS

The study faced certain limitations, including the need for specialized teachers in both language and science. As some teachers lacked disciplinary knowledge in natural sciences, it impacted the implementation of CLIL and limited the depth of science learning. Many teachers assigned to teach natural sciences were English as Foreign Language (EFL) teachers, leading to limitations in effectively delivering scientific concepts. The mastery of the foreign language often prevailed over the knowledge of science due to the lack of specialized training for teachers in specific subjects, such as natural sciences in English. This issue could not be so unique at Centro Educativo La Moderna, it could be rather reflected as a broader problem in private institutions with similar programs across the country, so further, this research could be a starting point for future research with a broader scope.

CONCLUSIONS

The research highlights the potential of Content and Language Integrated Learning as a powerful approach to enhance language learning and scientific understanding. By addressing the challenges and weaknesses through specialized teacher training and improved resources, CLIL can be successfully

implemented to create a more comprehensive and engaging learning experience in science classrooms taught in English.

However, to ensure the successful implementation of CLIL, several factors need to be considered. These include comprehensive teacher training, thoughtful curriculum design, effective assessment practices, and the selection of suitable materials and resources. Teachers' pedagogical content knowledge and language competence play a crucial role in delivering effective CLIL instruction.

Overall, the study highlights the potential of CLIL to revolutionize science education in the context of EFL instruction. By integrating language and subject matter, the school can offer a comprehensive education that prepares students to navigate an increasingly complex and globalized world. The findings of this research contribute to the growing body of knowledge on CLIL implementation and its impact on science education, providing valuable insights for educators, policymakers, and researchers striving to enhance language learning outcomes and subject-specific content knowledge.

RECOMMENDATIONS

To address the limitations and enhance the effectiveness of CLIL implementation, it is recommended to establish specialized training programs for teachers. These programs should focus on both language instruction and disciplinary knowledge to ensure comprehensive and effective CLIL delivery.

Additionally, educational institutions should invest in developing and providing suitable didactic materials and resources aligned with CLIL principles. Adequate technological infrastructure should be ensured to support seamless integration and engagement in CLIL lessons.

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