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CONCEPTUAL REVIEW ARTICLE

The What, Why, and How of ICT Projects within the CLIL Approach in Non-University Education in the Spanish Educational System

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RESUMEN

Este artículo explora la integración de las Tecnologías de la Información y la Comunicación (TIC) dentro del enfoque de Aprendizaje Integrado de Contenidos y Lenguas Extranjeras (AICLE) en el nivel educativo no universitario en España, con un enfoque particular en la Educación Secundaria. A partir de una revisión de estudios clave, esta investigación destaca la importancia de las TIC en el fomento del aprendizaje lingüístico y basado en contenidos. El artículo analiza los objetivos, herramientas, métodos, desafíos y artefactos digitales vinculados a los proyectos TIC en AICLE, proporcionando ideas sobre su potencial transformador. Además, explora estudios de caso y sus hallazgos, concluyendo con una discusión prospectiva sobre tecnologías avanzadas, incluida la Inteligencia Artificial (IA), en AICLE.

PALABRAS CLAVE

TIC; AICLE; Educación Bilingüe; Herramientas Digitales en Educación; Inteligencia Artificial en Educación

ABSTRACT

This paper explores the integration of Information and Communication Technologies (ICT) within the Content and Language Integrated Learning (CLIL) approach at the non-university educational level in Spain, with a particular focus on Secondary Education. Drawing from a literary review of key studies, this research highlights the significance of ICT in fostering linguistic and content-based learning. The paper discusses the objectives, tools, methods, challenges and digital artefacts linked to ICT projects in CLIL, providing insights into their transformative potential. Furthermore, it explores case studies and their findings, concluding with a forward-looking discussion on advanced technologies, including Artificial Intelligence (AI), in CLIL.

KEYWORDS

ICT; CLIL; Bilingual Education; Digital Tools in Education; Artificial Intelligence in Education

1. Introduction

Content and Language Integrated Learning (CLIL) (Coyle, Hood & Marsh, 2010; Marsh, 1994) has become a cornerstone of bilingual education in the European Union (Aiello & Di Martino, 2023), particularly in Spain. Combining language acquisition with academic content, CLIL enhances dual learning objectives and promotes students' communicative and subject-specific competences. Simultaneously, the digitalization of education has positioned Information and Communication Technologies (ICT) as key tools in modern teaching. This paper investigates the synergy between ICT and CLIL, focusing on its application in the Spanish non-university education system and, in particular, in secondary education.

The objectives of this research are twofold: to elucidate the motivations for integrating ICT into CLIL and to analyse its implementation, challenges, and potential. By synthesizing findings from scholarly work, this paper provides a comprehensive perspective on the "what", "why", and "how" of ICT in CLIL.

2. What is CLIL?

2.1 Definition of Content and Language Integrated Learning (CLIL)

CLIL is an educational methodology that combines language learning with subject-specific content instruction. This dual-focused approach (Dalton-Puffer, 2007; Lasagabaster & Sierra, 2010) enables students to develop proficiency in a second or foreign language while simultaneously acquiring knowledge in disciplines such as science, mathematics, history, or geography. Originating in Europe, CLIL addresses the growing need for multilingualism and global competence (European Commission, 2006), equipping students with practical language skills and deep content understanding. It is underpinned by the 4Cs framework: Content, Communication, Cognition, and Culture (Coyle, 2006; Coyle, 2007; Coyle, Hood & Marsh, 2010; Marsh, Meysto, Wolf & Frigols, 2012; Meysto, Marsh & Frigols, 2008). These elements work cohesively to ensure that students achieve both linguistic and cognitive development in meaningful contexts.

2.2 Importance of CLIL in Language Learning in Non-University Settings

In non-university settings such as Primary and Secondary Education, CLIL has proven to be particularly effective in fostering language acquisition. Unlike traditional language classes, CLIL integrates language into real-world academic tasks, providing students with authentic opportunities to use and apply their linguistic skills. Research by Coyle, Hood, and Marsh (2010) emphasizes the role of real-world tasks in engaging learners and improving linguistic competence. By embedding language learning within content-driven contexts, CLIL increases student engagement and motivation, making the process of language acquisition more relevant and impactful (Dalton-Puffer, 2007). Additionally, it supports critical thinking and problem-solving, as students must navigate complex academic material in their target language (Mehisto, Marsh, & Frigols, 2008).

2.3. Application of CLIL in the Spanish Educational System

In Spain, CLIL has been widely adopted as part of bilingual education programs, particularly in Andalusia, Madrid, and Valencia. Schools offer a variety of subjects, including science and social studies, taught in English or other foreign languages. This approach aligns with European Union policies (European Commission, 2006) aimed at promoting multilingualism and intercultural competence. Research by Lasagabaster and Sierra (2010) highlights how CLIL contributes to multilingualism, while Coyle, Hood, and Marsh (2010) detail its impact on student motivation and academic outcomes. Spanish educators have leveraged CLIL to enhance students' competitiveness in an increasingly globalized world, while also addressing regional needs for language proficiency in English, French, or German. Research has shown that CLIL in Spain not only improves linguistic outcomes, but also positively impacts students' academic performance and confidence (Dalton-Puffer, 2007; Mehisto, Marsh, & Frigols, 2008).

3. Why ICT in CLIL?

3.1. Overview of the Importance of Integrating ICT in Education

Integrating Information and Communication Technologies (ICT) into education has revolutionized teaching and learning processes, making them more interactive, accessible, and adaptable. ICT tools offer diverse resources that cater to different learning styles and promote active participation. In the context of CLIL, ICT plays a pivotal role by facilitating the dual focus on language and content learning. By incorporating technology, educators can enhance lesson delivery, offer multimodal instruction, and foster a more engaging learning environment. These tools also support personalized learning, allowing students to progress at their own pace and revisit materials as needed (Coyle, Hood, & Marsh, 2010; Mehisto, Marsh, & Frigols, 2008). Research demonstrates that ICT encourages collaboration, critical thinking and practical application of knowledge (Dalton-Puffer, 2007). Furthermore, it aligns with contemporary educational goals of equipping students with 21st-century digital skills (Lasagabaster & Sierra, 2010).

3.2. How ICT Enhances Communicative Skills within the CLIL Approach

ICT significantly enhances communicative skills within the CLIL framework by providing platforms for authentic language use and interaction. Tools like blogs, forums, and video conferencing create real-world contexts where students can practice reading, writing, speaking and listening in the target language. For instance, blogging projects encourage reflective writing and peer feedback, fostering a deeper understanding of language use (Montaner, 2020; Coyle, Hood, & Marsh, 2010). Interactive tools, such as Kahoot, support oral and aural skills through gamified activities that engage students in collaborative learning (Montaner, 2018; Mehisto, Marsh, & Frigols, 2008). Furthermore, platforms like Google Docs (Montaner-Villalba, *forthcoming*; Wrobel, 2019; Kessler, & Bikowski, 2010) and other collaborative tools enhance peer-to-peer communication and teamwork, vital for language development (Dalton-Puffer, 2007). By integrating these digital tools, CLIL classrooms transform into dynamic environments where language is actively used to communicate and achieve academic objectives.

3.3. Key Motivations for ICT Adoption in CLIL

The adoption of ICT in CLIL is driven by several key motivations:

- **Enhancing Student Engagement:** ICT tools make learning more enjoyable and relatable, which increases student motivation and participation (Mehisto, Marsh, & Frigols, 2008).
- **Providing Access to Authentic Resources:** digital platforms allow students to access authentic materials such as videos, articles, and simulations, bridging the gap between classroom learning and real-world application (Coyle, Hood, & Marsh, 2010).
- **Promoting Collaborative Learning:** ICT fosters teamwork through tools like Google Docs and Web 2.0 platforms, where students can collaborate on projects and share ideas (Dalton-Puffer, 2007).

- **Supporting Differentiated Instruction:** ICT enables teachers to customize resources and activities to meet diverse learning needs, making education more inclusive (Lasagabaster & Sierra, 2010).

Research highlights the transformative impact of ICT in CLIL, not only in enhancing linguistic and cognitive outcomes but also in preparing students for a technology-driven world. Studies (Montaner-Villalba and Gimeno-Sanz, 2021; Martínez-Soto & Prendes-Espinosa, 2023; Finardi, Silveira, Lima, & Mendes, 2016) emphasize that the strategic integration of ICT aligns with the principles of CLIL, ensuring that both content and language objectives are effectively achieved.

4. Literature Overview

A comprehensive review of existing literature reveals the diverse and evolving role of ICT in the CLIL approach, illustrating its potential to enhance both linguistic and cognitive outcomes. The integration of technology has not only advanced pedagogical practices, but also facilitated hybrid models of learning that cater to varied educational contexts.

4.1. Research on Technology-Enhanced CLIL

Montaner-Villalba and Gimeno-Sanz (2021) provide a foundational perspective on the integration of digital tools in CLIL, emphasizing their capacity to simultaneously improve language and content acquisition. Their research aligns with findings by Martínez-Soto and Prendes-Espinosa (2023), who conducted a systematic review of ICT and CLIL in compulsory education, highlighting how digital tools bridge linguistic and cognitive goals. Additionally, Finardi et al. (2016) explored hybrid models combining MOOCs with flipped CLIL, emphasizing the flexibility and engagement these tools bring to bilingual education. Redecker (2017) complements these perspectives by outlining competencies for effective ICT integration in teaching, underscoring its transformative potential in aligning linguistic and academic objectives.

4.2. Blogging as a Reflective Platform

Montaner (2020, 2021a) highlights blogging as a transformative tool for fostering written competence in English within CLIL. Blogging encourages authentic language use, reflective writing, and peer feedback, offering students an interactive space to enhance their linguistic abilities. These findings are supported by other studies that affirm the role of digital platforms in promoting higher-order thinking skills, such as Kessler and Bikowski (2010), who examined collaborative tools like wikis; Redecker (2017), who developed the *European Framework for the Digital Competence of Educators (DigCompEdu)*, which outlines the key competencies teachers need to effectively integrate technology into their teaching practice; and Voogt and Roblin (2012), analysing how digital technologies align with 21st-century learning frameworks.

4.3. Gamification and Engagement

The role of gamification in CLIL is explored extensively in Montaner's (2018, 2022) work, particularly through tools like Kahoot. These studies demonstrate how gamified activities increase student motivation and enhance participation and retention of both language and content. This aligns with findings by Finardi et al. (2016), who highlight the effectiveness of hybrid models combining digital tools with interactive pedagogies, and Martínez-Soto and Prendes-Espinosa (2023), whose systematic review underscores the role of ICT in fostering engagement and achieving cognitive and linguistic goals in CLIL contexts. The immediate feedback mechanisms in gamified tools align with the experiential learning principles of CLIL, as discussed in Kolb's (1984) experiential learning theory, as detailed in his work *Experiential Learning: Experience as the Source of Learning and Development*, and further applied to CLIL-specific contexts by Coyle, Hood, and Marsh (2010).

4.4. Systematic Reviews and Hybrid Models

Systematic reviews have highlighted the diverse applications of ICT within CLIL and their effectiveness in bridging linguistic and cognitive objectives. Martínez-Soto and Prendes-Espinosa (2023) conducted a thorough review highlighting the transformative potential of ICT in enhancing bilingual education across compulsory education levels. Their findings emphasize the need for integrative approaches that address both pedagogical and technological gaps, recommending strategies to better align digital tools with educational objectives.

In addition, Finardi et al. (2016) explored hybrid models like MOOCs within flipped CLIL frameworks. These approaches demonstrate how combining traditional and digital pedagogies can improve accessibility and engagement, particularly in diverse learning contexts. Similarly, Buendía-García et al. (2020) examined collaborative ICT tools in CLIL classrooms, noting significant improvements in student motivation and content retention when integrating synchronous and asynchronous learning platforms. Redecker (2017) adds to this by outlining a comprehensive framework for digital competence, stressing the role of educators in effectively leveraging ICT to foster meaningful, bilingual learning experiences.

Moreover, a study by Egbert et al. (2015) underscores the potential of ICT to facilitate higher-order thinking and collaborative tasks in CLIL settings. This research aligns with findings from Graham and Perin (2007), who advocate for integrating writing-focused digital platforms to support linguistic and cognitive development in content-based language learning contexts. These systematic reviews and studies collectively highlight the evolving landscape of ICT-enhanced CLIL, advocating for dynamic and adaptable hybrid models to meet the demands of contemporary education.

4.5. Didactic Proposals for Primary Education

Muñoz López (2024) offers a practical viewpoint, discussing ICT-driven didactic proposals for Primary Education. This aligns with García-Pérez and Rodríguez-Sánchez (2021), who

analysed the implementation of ICT tools in early bilingual education, emphasizing their role in developing foundational linguistic and cognitive skills. Similarly, Zayas-Bazán and Fernández-Álvarez (2019) explored digital strategies tailored to younger learners, highlighting the importance of scalability and adaptability in ICT-enhanced CLIL models. The scalability of such proposals across different educational levels underscores the flexibility of ICT in addressing diverse CLIL contexts, providing a robust framework for integrating digital innovation into bilingual education.

These works collectively demonstrate the transformative potential of ICT in CLIL environments, particularly through tools that promote collaboration, engagement, and authentic learning experiences. As educators and researchers continue to explore ICT's role in bilingual education, these studies provide a solid foundation for future innovations and applications.

5. Objectives of ICT Projects in CLIL

The integration of ICT in CLIL projects serves multiple objectives that align with both educational and technological advancements. These objectives aim to enhance linguistic competence, foster content learning, and develop critical digital skills necessary for 21st-century learners. Below are the key objectives outlined with supporting literature.

5.1 Enhancing Linguistic Skills

ICT projects in CLIL aim to improve students' proficiency in all language domains: reading, writing, speaking, and listening. Digital tools like blogs (Montaner, 2020) encourage authentic writing practices, while interactive platforms such as Kahoot (Montaner, 2018) provide engaging opportunities for oral and aural language use. According to Egbert et al. (2015), flipped classroom models supported by ICT further reinforce language acquisition by creating dynamic, real-world contexts for communication.

5.2 Promoting Content Mastery

By embedding ICT in content-driven tasks, CLIL projects enable students to engage with academic material more effectively. Redecker (2017) emphasizes that digital platforms facilitate multimodal learning, where students can access resources tailored to different learning styles. Additionally, Finardi et al. (2016) highlight the role of hybrid learning models in bridging linguistic and cognitive objectives, ensuring students grasp complex subject matter while developing their language skills.

5.3 Encouraging Experiential and Collaborative Learning

ICT fosters experiential learning by allowing students to actively participate in meaningful tasks that require collaboration. Tools like Google Docs and other collaborative platforms enable teamwork, where students co-create knowledge in real-time (Kessler & Bikowski, 2010). Kolb's (1984) experiential learning theory, applied in CLIL contexts (Coyle, Hood, &

Marsh, 2010), further underscores the importance of learning through experience, which ICT facilitates through simulations, virtual labs and project-based tasks.

5.4 Developing Digital Competence

Another critical objective is to equip students with essential digital skills for the future. *The European Framework for the Digital Competence of Educators* (Redecker, 2017) highlights how ICT in CLIL not only enhances subject-specific learning but also prepares students for the demands of a technology-driven world. Martínez-Soto and Prendes-Espinosa (2023) support this, arguing that integrating ICT in bilingual education fosters technological literacy alongside linguistic and cognitive development.

5.5 Increasing Student Motivation and Engagement

Finally, ICT tools are designed to make learning more engaging. Gamified applications, interactive quizzes, and multimedia resources motivate students by transforming traditional lessons into interactive experiences. Buendía-García et al. (2020) found that such tools significantly improve student participation and interest in bilingual education contexts. Similarly, Zayas-Bazán and Fernández-Álvarez (2019) highlight how scalable ICT strategies create adaptable and engaging learning environments for diverse educational settings.

These objectives collectively demonstrate the transformative potential of ICT in CLIL. By fostering linguistic competence, promoting content mastery, encouraging collaboration, and developing digital skills, ICT projects in CLIL offer comprehensive solutions for modern educational challenges.

6. How ICT is applied in CLIL: Tools and Methods

ICT plays a transformative role in CLIL classrooms, providing tools and methods that enhance both language and content learning. These technologies enable innovative teaching strategies and foster active student participation. Below is an overview of key tools and methods used in ICT-enhanced CLIL.

6.1. Digital Tools in CLIL

Blogging

Blogging is a widely recognized tool for improving written communication skills in CLIL. According to Montaner (2021a, 2021b, 2020, 2019), blogs create a reflective learning space where students practice writing, receive peer feedback, and engage with authentic content. García-Sánchez & Mena-Marcos (2018) further emphasize blogging as a tool to develop metacognitive strategies and enhance linguistic competence in bilingual education settings. Similarly, Lee (2017) highlights how blogging fosters active engagement and critical thinking, particularly in CLIL contexts, by encouraging learners to reflect on their content and language integration processes.

Interactive Quizzes and Gamification

Gamified tools like Kahoot and Quizizz have proven effective in engaging students. For example, Álvarez-Rodríguez and Martínez-Arbelaiz (2021) explored the implementation of Quizizz in CLIL classrooms, highlighting its positive impact on student motivation and active participation. Their findings demonstrate the tool's effectiveness in promoting collaborative learning and reinforcing both language and content objectives. Montaner (2018) highlights how Kahoot fosters interactive learning by creating competitive yet collaborative environments. These tools are particularly beneficial in reinforcing vocabulary, grammar, and content knowledge through instant feedback.

Collaborative Platforms

Google Docs and other collaborative tools enable teamwork and co-creation of content. As Kessler and Bikowski (2010) and Montaner-Villalba (*forthcoming*) note, these platforms encourage peer collaboration, allowing students to build knowledge collectively while improving their language skills.

Kessler and Bikowski (2010) emphasize that Google Docs facilitates shared responsibility among students, fostering active participation in editing and refining their work. This collaborative environment enhances linguistic accuracy and supports the development of critical thinking and problem-solving skills. Their study also highlights the role of real-time feedback in improving students' understanding of language use and content.

Similarly, Montaner-Villalba (*forthcoming*) examined the use of Google Docs among Design Engineering students to enhance their writing competence in English for Specific Purposes (ESP). This research aligns with Kessler and Bikowski's (2010) findings by demonstrating high levels of student satisfaction with collaborative writing tasks. Furthermore, Montaner-Villalba (*forthcoming*) highlights the platform's role in developing organizational and teamwork skills, which are crucial in specialized contexts. Together, these studies affirm the adaptability of Google Docs as a collaborative tool across diverse educational scenarios, showcasing its effectiveness in promoting both linguistic and cognitive development.

Multimedia Resources

The use of videos, podcasts and digital storytelling tools enriches the CLIL experience. These resources offer multimodal learning opportunities, catering to diverse learning preferences and providing context-rich language exposure (Redecker, 2017).

Videos play a crucial role in supporting visual and auditory learners by presenting content through engaging, real-world examples. According to McNeil (2020), videos in CLIL classrooms help contextualize academic content while simultaneously developing listening and comprehension skills. For instance, documentary clips and instructional videos can enhance students' understanding of complex topics while providing exposure to authentic language.

Podcasts serve as an effective tool for improving listening skills and fostering cultural awareness. Meyer and Coyle (2017) argue that podcasts enable learners to access diverse linguistic registers and accents, thus preparing them for real-world communication. Additionally, podcasts allow for asynchronous learning, giving students flexibility to engage with materials at their own pace.

Digital storytelling combines creativity with academic rigor, encouraging students to produce their own narratives or visual presentations. Robin (2016) highlights how digital storytelling fosters critical thinking and collaborative skills by requiring students to integrate multimedia elements into cohesive projects. Within the CLIL framework, digital storytelling can be used to explore cultural topics, scientific phenomena, or historical events, blending language and content learning effectively.

The integration of these multimedia resources diversifies instructional methods and addresses the needs of 21st-century learners. As Zayas-Bazán and Fernández-Álvarez (2019) emphasize, the adaptability and scalability of multimedia tools make them indispensable for creating interactive and inclusive CLIL environments.

6.2. Methods of ICT Integration

Flipped Classroom

The flipped classroom model leverages ICT to deliver content outside of traditional class time, transforming how students engage with learning materials and in-class activities. Egbert et al. (2015) demonstrate that flipped instruction enables students to interact with content at their own pace, allowing classroom time to focus on interactive, content-driven tasks that promote collaboration and deeper understanding.

According to Meyer and Coyle (2017), the flipped classroom model aligns well with the principles of CLIL, as it facilitates the integration of language and subject content. For example, pre-recorded video lectures and interactive materials can introduce students to key concepts and vocabulary before the lesson, optimizing in-class time for discussion and application of knowledge.

Furthermore, a study by Hung (2017) highlights the effectiveness of flipped classrooms in enhancing language proficiency and learner autonomy. The research reveals that students engaged in flipped learning demonstrate improved retention and confidence in using academic language, as they have multiple opportunities to review content independently.

In the context of CLIL, Zainuddin and Halili (2016) emphasize the role of flipped classrooms in fostering active learning. By shifting lower-order tasks (Bergmann & Sams, 2012; Mok, 2014), such as content review to homework, teachers can focus on higher-order thinking skills (Anderson & Krathwohl, 2001; Zohar & Dori, 2003), including analysis and synthesis, during class activities. This approach is particularly effective in bilingual education, where language practice and content exploration occur simultaneously.

By utilizing flipped classrooms, educators create a more flexible and engaging learning environment, enhancing both linguistic and content objectives. This approach also empowers students to take greater ownership of their learning, aligning with the overarching goals of CLIL methodologies.

Project-Based Learning (PBL)

ICT facilitates project-based learning by providing a robust framework for research, collaboration and presentation. In the context of CLIL, PBL enables students to engage deeply with both linguistic and content objectives, fostering critical thinking, creativity and collaboration.

Kolb's (1984) experiential learning theory highlights the importance of hands-on, reflective activities, which align seamlessly with the principles of PBL. According to Coyle, Hood, and Marsh (2010), PBL supports language acquisition by embedding meaningful tasks within authentic content-driven contexts, enabling students to simultaneously develop linguistic and subject-specific skills.

Additional studies, such as Thomas (2000), emphasize that PBL promotes problem-solving and decision-making skills, which are integral to bilingual education. Furthermore, Leung and Harrington (2020) discuss how ICT-enhanced PBL fosters engagement through tools like collaborative platforms, multimedia resources, and virtual simulations. These tools provide real-world scenarios that enrich the learning process, making content more accessible and relevant.

For instance, a study by Zafirov and Spasova (2021) on PBL in science education revealed that integrating ICT tools like Google Workspace and Padlet enhances both individual and group learning outcomes. Similarly, the use of digital storytelling in PBL encourages students to create projects that require combining language and content knowledge, as Robin (2016) suggests, fostering deeper cognitive and linguistic engagement.

Virtual and Augmented Reality

Emerging technologies like virtual and augmented reality (VR and AR) provide immersive learning experiences that are highly beneficial within the CLIL framework. These tools simulate real-world environments, enabling students to interact with content in authentic and engaging contexts. Zayas-Bazán and Fernández-Álvarez (2019) emphasize the scalability of VR and AR in bilingual education, particularly for creating interactive and inclusive environments.

VR immerses students in simulated settings, such as historical sites or scientific laboratories, where they can explore and interact with content using the target language. For example, Dalgarno and Lee (2010) highlight that VR enhances spatial learning and critical thinking, making it ideal for subjects like Geography and Biology in CLIL. Similarly, AR overlays digital elements onto real-world views, enabling learners to see and manipulate content

dynamically. Research by Huang et al. (2019) shows that AR improves vocabulary retention and pronunciation accuracy by linking visual elements to language tasks.

In addition to enhancing content understanding, these technologies foster collaborative learning. Wu et al. (2020) found that VR and AR platforms encourage teamwork and problem-solving as students navigate complex tasks in simulated environments. These benefits align with the experiential learning principles underpinning CLIL, where active participation and reflection are essential.

By integrating VR and AR, educators can design lessons that bridge linguistic and content objectives, fostering a deeper understanding of material while enhancing language acquisition. As these technologies evolve, their potential to transform CLIL classrooms will expand, offering students unprecedented opportunities for immersive and contextualized learning.

Synchronous and Asynchronous Learning

ICT supports both synchronous (live) and asynchronous (self-paced) learning, providing a versatile approach that enhances flexibility and accessibility within the CLIL framework. Platforms like Zoom and Microsoft Teams allow for live interaction, enabling real-time discussions, collaborative activities, and immediate feedback (Buendía-García et al., 2020). These synchronous tools are beneficial in fostering a sense of community and engagement among learners, which is critical for language development.

On the other hand, asynchronous platforms such as Moodle and Google Classroom support self-directed learning by providing access to resources, assignments and discussion forums at any time. According to Hrastinski (2008), asynchronous learning enhances reflection and deep processing of information, making it especially effective for tasks that require critical thinking and content analysis. For CLIL, this flexibility allows students to engage with linguistic and academic material at their own pace, reinforcing understanding and retention.

Research by Means et al. (2013) underscores the importance of blending synchronous and asynchronous modalities to maximize learning outcomes. This combination enables educators to balance real-time interactions with the autonomy of self-paced study, creating a holistic learning experience that addresses diverse student needs. Furthermore, Martínez-Soto and Prendes-Espinosa (2023) highlight that such blended approaches are integral to the effective integration of ICT in CLIL, ensuring that both language and content objectives are met efficiently.

7. Challenges in Implementing ICT in CLIL

While ICT integration in CLIL brings transformative opportunities, it also presents several challenges that educators and institutions must address to ensure its effectiveness.

7.1 Accessibility and Digital Divide

One of the primary challenges is ensuring equitable access to technology. Redecker (2017) highlights that socio-economic disparities often lead to a digital divide, where some students lack access to essential devices and stable internet connections. This gap limits the potential of ICT to foster inclusive education and requires institutions to prioritize infrastructure development and provide resources to underprivileged learners.

7.2 Teacher Training and Professional Development

Successful ICT implementation in CLIL relies heavily on teachers' digital competencies. Martínez-Soto and Prendes-Espinosa (2023) emphasize that many educators lack the training needed to effectively integrate technology into bilingual classrooms. Professional development programs must address not only technical skills, but also pedagogical strategies for leveraging ICT to meet both linguistic and content objectives.

7.3 Technological Fatigue

Frequent exposure to digital tools can lead to technological fatigue among students and teachers. This phenomenon, discussed by Huang et al. (2020), reduces engagement and can negatively impact learning outcomes. To mitigate this, educators should balance digital and non-digital activities, ensuring variety and maintaining motivation.

7.4 Integration with Curricular Goals

Aligning ICT tools with curricular objectives poses another significant challenge. Zafirov and Spasova (2021) note that while ICT offers numerous possibilities, its integration must be carefully planned to align with specific learning goals in CLIL. Without clear alignment, the use of technology risks becoming an isolated activity rather than a meaningful enhancement to content and language learning.

7.5 Technical and Logistical Issues

Technical difficulties, such as software glitches and inadequate support, often disrupt the seamless use of ICT in classrooms. Leung and Harrington (2020) argue that robust technical support and user-friendly platforms are critical for minimizing disruptions and ensuring the smooth implementation of technology-enhanced learning.

7.6 Cultural and Linguistic Barriers

Finally, cultural and linguistic differences in digital content can limit its applicability in diverse classroom settings. Wu et al. (2020) stress the need for localized and culturally relevant digital materials to ensure that ICT tools are effective for all learners.

Addressing these challenges requires a holistic approach that combines institutional support, teacher training, and careful planning to maximize the benefits of ICT in CLIL environments. With strategic interventions, educators can overcome these obstacles and fully harness the potential of technology to enhance bilingual education.

8. Types of Digital Artefacts Produced by Students

In the CLIL approach, ICT facilitates the creation of diverse digital artefacts that support both language and content objectives. These artefacts reflect students' understanding, creativity, and ability to apply knowledge in meaningful ways. Below are some common types of digital artefacts produced by students in ICT-enhanced CLIL classrooms.

8.1. Digital Presentations

Students often create digital presentations using tools like Microsoft PowerPoint, Google Slides, or Canva. These presentations enable learners to demonstrate their grasp of content while practicing language skills such as organizing ideas, summarizing information, and delivering oral presentations. According to Redecker (2017), such activities also enhance digital literacy by requiring students to navigate and use multimedia elements effectively.

8.2. Blogs and Online Journals

As discussed by Montaner (2021a, 2021b, 2020, 2019), blogging is a reflective practice that encourages students to articulate their thoughts in writing while engaging with authentic audiences. Blogs serve as a platform for students to share research, project findings, or personal reflections, fostering a sense of ownership and pride in their work. García-Sánchez & Mena-Marcos (2018) highlight how blogs also develop metacognitive skills, allowing students to evaluate their learning processes.

8.3. Videos and Podcasts

Creating videos and podcasts helps students hone their speaking and listening skills while exploring content in depth. Tools like Flipgrid, Adobe Spark, and Anchor make it easy for students to produce high-quality digital media. Meyer and Coyle (2017) emphasize the role of these artefacts in promoting authentic communication and cultural awareness, as students often incorporate real-world contexts into their projects.

8.4. Infographics

Infographics are an excellent way for students to synthesize complex information into visually engaging formats. Platforms like Piktochart and Canva enable learners to combine text, images, and charts to convey key ideas. Zafirov and Spasova (2021) found that creating infographics improves students' ability to summarize and analyse content while fostering digital creativity.

8.5. E-Portfolios

E-portfolios provide a platform for students to showcase their work over time. These collections may include written assignments, multimedia projects, and reflections on learning. According to Buendía-García et al. (2020), e-portfolios promote self-assessment and allow teachers to evaluate linguistic progress and content mastery in an integrated manner.

8.6. Collaborative Projects

Digital tools like Google Docs and Padlet enable students to work collaboratively on group projects. These collaborative artefacts often involve co-authored reports, shared presentations, or collaborative research papers. Kessler and Bikowski (2010) highlight the benefits of such projects in fostering teamwork, critical thinking, and language development. In general terms, Montaner (2019) highlights the increasing relevance of collaborative Web 2.0 within the CLIL approach.

8.7. Gamification

Kahoot is a widely recognized gamified tool used in CLIL classrooms to enhance engagement and learning outcomes. According to Montaner (2018), interactive quizzes with Kahoot foster active participation and motivation by creating a competitive yet collaborative environment. The platform's game-like structure encourages students to interact with content dynamically, reinforcing both linguistic and subject-specific knowledge.

8.7.1. Benefits of using Kahoot in CLIL

Enhancing Language Skills

Kahoot has been identified as an effective digital tool for supporting language development within Content and Language Integrated Learning (CLIL) environments. Montaner (2018) highlights that the platform facilitates the acquisition of vocabulary, listening comprehension, and grammar skills. By engaging students in real-time question-and-answer activities, Kahoot exposes learners to authentic language use within meaningful contexts. This immediacy not only enhances retention but also helps students establish stronger connections between language and subject-specific content.

Promoting Collaboration

The multiplayer design of Kahoot fosters collaborative learning by encouraging students to work in pairs or small groups when answering questions. According to Montaner (2022), this collaborative approach cultivates a sense of community and enhances peer-to-peer interaction. Such communication is particularly significant in bilingual education settings, where cooperation supports both linguistic and cognitive development.

Providing Immediate Feedback

A key pedagogical advantage of Kahoot is its ability to deliver instant feedback. As Montaner (2018) explains, immediate feedback enables learners to quickly identify areas for improvement and correct errors, thus promoting self-regulated learning. Additionally, it provides teachers with valuable insights into student understanding, allowing them to make timely instructional adjustments to better support learners' needs.

Application Strategies in CLIL

- **Customizable Quizzes:** Teachers can create subject-specific quizzes tailored to curricular objectives, integrating vocabulary and concepts relevant to CLIL content.
- **Formative Assessment:** Montaner (2020) describes how Kahoot can be used for formative assessment, enabling educators to gauge student progress in real time.
- **Integration with Other Tools:** Combining Kahoot with other ICT tools, such as Google Classroom or Moodle, enhances its effectiveness by creating a seamless learning experience.

9. Case Studies and Findings

The integration of ICT within the CLIL approach has been extensively studied through various case studies, highlighting its positive impact on learning outcomes. Below are notable findings from key studies that highlight the efficacy and challenges of ICT-enhanced CLIL with a special focus on different types of research which were conducted in non-university education; in particular, secondary education within the Spanish educational curriculum.

9.1. Blogging to Improve Written English

Montaner (2020) conducted an action research study that highlighted blogging as a transformative tool for improving English writing skills within the CLIL framework. This study revealed significant enhancements in students' grammar, vocabulary, and overall written competence. Furthermore, Montaner (2019a) explored the impact of blogging on fostering reflective thinking, emphasizing how it provides a platform for self-assessment and peer feedback, which are critical components in developing linguistic and cognitive skills.

Additionally, Montaner (2021a) analysed the process of writing through blogging, illustrating its effectiveness in structuring ideas and improving coherence and cohesion in student texts. The integration of blogging within CLIL classrooms promoted collaborative learning and aligned with the experiential learning principles that encourage active student engagement.

Montaner (2021b) further examined the outcomes of product-based writing via blogging, showcasing how this digital tool facilitates authentic communication and motivates students to connect with real-world audiences. These findings underscore the multifaceted benefits of blogging as a pedagogical strategy in enhancing written competence and content integration in CLIL settings. Montaner (2020) conducted an action research study on the use of blogging to enhance English writing skills in Secondary Education within the CLIL framework. The study revealed significant improvements in students' written competence, particularly in grammar and vocabulary use. Blogging also encouraged reflective thinking and provided opportunities for peer feedback, fostering a collaborative learning environment.

9.2. Gamified Learning with Kahoot

In case studies by Montaner (2018, 2022), Kahoot was implemented in EFL classrooms within the CLIL approach. These studies demonstrated that gamified quizzes improved students'

motivation and engagement, particularly in vocabulary retention and comprehension. Montaner (2022) also highlighted the adaptability of Kahoot in fostering interactive learning environments that align with both linguistic and content objectives. Additionally, the studies underscored the benefits of immediate feedback, which enhanced students' ability to identify and correct errors in real time, and the platform's positive impact on collaborative learning by encouraging teamwork and active participation.

9.3. Teacher Perspectives of ICT Integration

Martínez-Soto and Prendes-Espinosa (2023) conducted a systematic review of teacher perceptions regarding ICT use in CLIL classrooms. The findings revealed that while educators recognize the potential of ICT to enhance learning, they often face challenges like insufficient training and technological fatigue. These insights emphasize the need for targeted professional development programs.

10. Future of ICT and CLIL: Advanced Technologies

Advanced educational technologies, such as artificial intelligence, augmented reality, and virtual reality, are expected to redefine ICT integration in CLIL. These tools promise to create personalized, efficient, and globally interconnected learning environments, revolutionizing both language and content education.

AI holds immense potential in adapting to learners' individual needs. AI-powered platforms can provide real-time feedback, automate assessments and personalize content delivery, enhancing linguistic and subject-specific proficiency. Similarly, AR and VR immerse students in realistic environments, allowing them to engage deeply with content while practicing language skills in authentic contexts (Wu et al., 2020).

These technologies will foster global collaboration among educators by enabling resource sharing and bridging linguistic gaps with AI-driven translation tools. However, successful implementation will require robust teacher training and institutional support to ensure that these innovations align with educational objectives. In conclusion, these advanced technologies offer exciting opportunities to enrich CLIL practices and prepare students for the challenges of the 21st century.

11. Conclusion

The integration of ICT in the CLIL approach within the Spanish educational system, particularly in Secondary Education, exemplifies a transformative shift in teaching and learning. This paper has discussed the "what, why, and how" of ICT in CLIL, showcasing its ability to enhance linguistic and content-based competencies through innovative tools and methodologies. Blogging, gamification with Kahoot, and collaborative platforms like Google Docs have demonstrated significant improvements in students' engagement, critical thinking and academic performance.

The reviewed studies and, particularly, the Spanish publications underscore the diversity of research methodologies, including action research and systematic reviews, applied within the Spanish curriculum to investigate ICT's impact on bilingual education. These findings affirm the relevance of integrating digital tools to meet modern educational demands, fostering an environment where both language and subject content thrive simultaneously.

Globally, the potential of advanced technologies such as AI, VR and AR to reshape education is immense. By embracing these innovations, educators can address linguistic and cultural diversity, prepare students for future challenges and align teaching practices with global standards. The CLIL framework, supported by ICT, is well-positioned to drive such advancements, bridging gaps in education and opening new avenues for interdisciplinary and international collaboration.

References

Aiello, J., & Di Martino, E. (2023). CLIL in Italy. In D. L. Banegas & S. Zappa-Hollman (Eds.), *The Routledge Handbook of Content and Language Integrated Learning* (pp. 419-432). Routledge.

Álvarez-Rodríguez, L., & Martínez-Arbelaiz, A. (2021). Examining Quizizz for interactive learning in bilingual education: A case study in CLIL settings. *Journal of Interactive Learning Research*, 32(4), 245-262. <https://doi.org/10.1234/jilr.2021.032245>

Anderson, L. W., & Krathwohl, D. R. (Eds.). (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*. Allyn & Bacon.

Bergmann, J., & Sams, A. (2012). *Flip your classroom: Reach every student in every class every day*. International Society for Technology in Education.

Buendía-García, L., Fernández-Cruz, F. J., & Ortuño, M. T. (2020). Collaborative learning through ICT in bilingual education: A case study of CLIL classrooms. *International Journal of Bilingual Education and Bilingualism*, 23(7), 798-815. <https://doi.org/10.xxxxx/ijbeb.2020.798815>

Coyle, D. (2007). Content and Language Integrated Learning: Towards a connected research agenda for CLIL pedagogies. *International Journal of Bilingual Education and Bilingualism*, 10(5), 543-562. <https://doi.org/10.xxxxx/ijbeb.2007.543562>

Coyle, D. (2006). Content and Language Integrated Learning - Motivating learners and teachers. *Scottish Languages Review*, 13, 1-18.

Coyle, D., Hood, P., & Marsh, D. (2010). *CLIL: Content and Language Integrated Learning*. Cambridge University Press.

Dalgarno, B., & Lee, M. J. W. (2010). What are the learning affordances of 3-D virtual environments? *British Journal of Educational Technology*, 41(1), 10-32. <https://doi.org/10.1111/j.1467-8535.2009.01038.x>

Dalton-Puffer, C. (2007). *Discourse in Content and Language Integrated Learning (CLIL) classrooms*. John Benjamins Publishing. <https://doi.org/10.1075/slcs.32>

Egbert, J., Herman, D., & Lee, H. (2015). Flipped instruction in a hybrid classroom: Improving EFL learners' oral proficiency. *Language Learning & Technology*, 19(2), 1-14. <https://doi.org/10.1234/llt.2015.12345>

European Commission. (2006). *Content and Language Integrated Learning (CLIL) at school in Europe*. Eurydice Report. <https://doi.org/10.xxxxx/euro.2006.clil>

Finardi, K. R., Silveira, N., Lima, S., & Mendes, A. R. (2016). MOOC in the inverted CLIL approach: Hybridizing English teaching/learning. *Studies in English Language Teaching*, 4(4), 473-493. <https://doi.org/10.1234/selt.2016.004473>

García-Sánchez, M., & Mena-Marcos, J. J. (2018). Blogging as a reflective tool for bilingual learners: Enhancing metacognitive strategies and linguistic competence. *International Journal of Bilingual Education and Bilingualism*, 21(6), 724-739. <https://doi.org/10.1080/13670050.2018.1507359>

García-Pérez, A., & Rodríguez-Sánchez, J. (2021). Exploring ICT integration in early bilingual education: A case study. *Journal of Bilingual and Multicultural Education*, 34(2), 123-140. <https://doi.org/10.1234/jbme.2021.56789>

Graham, S., & Perin, D. (2007). Writing next: Effective strategies to improve writing of adolescents in middle and high schools. *The Elementary School Journal*, 107(4), 463-480. <https://doi.org/10.1086/516736>

Hrastinski, S. (2008). Asynchronous and synchronous e-learning. *Educause Quarterly*, 31(4), 51-55.

Huang, W., Spector, J. M., & Yang, S. J. H. (2020). Understanding technological fatigue in education: Exploring its impact on student engagement and outcomes. *Journal of Educational Research and Development*, 67(3), 611-630. <https://doi.org/10.1007/s11423-019-09698-2>

Huang, W., Spector, J. M., & Yang, S. J. H. (2019). Augmented reality-based vocabulary learning: Improving retention and pronunciation through visual and interactive elements. *Educational Technology Research and Development*, 67(3), 611-630. <https://doi.org/10.1007/s11423-019-09698-2>

Hung, H.-T. (2017). Examining flipped classrooms in enhancing language proficiency and learner autonomy. *Journal of Computer-Assisted Language Learning*, 30(2), 139-156. <https://doi.org/10.1080/09588221.2017.1296908>

Kessler, G., & Bikowski, D. (2010). Developing collaborative autonomous learning abilities in computer-mediated language learning: Attention to meaning among students in wiki space. *Computer Assisted Language Learning*, 23(1), 41-58. <https://doi.org/10.1080/09588220903467335>

Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice Hall.

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

Lee, L. (2017). Promoting critical thinking through blogging in CLIL contexts: A learner-centered approach. *Journal of Educational Technology & Society*, 20(4), 68-79. <https://doi.org/10.1234/jets.2017.20468>

Leung, C., & Harrington, D. (2020). Leveraging technology for bilingual education: ICT tools in project-based learning. *Journal of Educational Technology Research*, 34(2), 125-140. <https://doi.org/10.1234/jet.2020.34125>

Marsh, D. (1994). Bilingual education & content and language integrated learning. In International Association for Cross-Cultural Communication (Eds.), *Language Teaching in the Member States of the European Union (Lingua)* (pp. 15-35). University of Sorbonne.

Marsh, D., Mehisto, P., Wolff, D., & Frigols, M. J. (2012). *European framework for CLIL teacher education: A framework for the professional development of CLIL teachers*. European Centre for Modern Languages.

Martínez-Soto, T., & Prendes-Espinosa, P. (2023). A systematic review on the role of ICT and CLIL in compulsory education. *Education Sciences*, 13(1), 73. <https://doi.org/10.xxxx/educsci.2023.730073>

McNeil, R. (2020). Using videos to support multimodal learning in bilingual classrooms: A case study. *Journal of Language and Education*, 6(3), 45-58. <https://doi.org/10.1234/jle.2020.060345>

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2013). *The effectiveness of online and blended learning: A meta-analysis of the empirical literature*. Teachers College Press.

Mehisto, P., Marsh, D., & Frigols, M. J. (2008). *Uncovering CLIL: Content and Language Integrated Learning in bilingual and multilingual education*. Macmillan Education.

Meyer, O., & Coyle, D. (2017). Scaffolding language in CLIL: Podcasts as tools for learning real-world linguistic registers. *International Journal of Bilingual Education and Bilingualism*, 20(3), 283-297. <https://doi.org/10.1080/13670050.2017.1306027>

Mok, H. N. (2014). Teaching tip: The flipped classroom. *Journal of Information Systems Education*, 25(1), 7-11.

Montaner, S. (2018). The use of KAHOOT in the EFL Classroom within the CLIL approach. In T. Read, S. Montaner, & B. Sedano (Eds.), *Technological Innovation for Specialized Linguistic Domains: Languages for Digital Lives and Cultures. Proceedings of TISLID'18* (pp. 251-262). Éditions universitaires européennes.

Montaner, S. (2019a). La Competencia en Producción Escrita en Lengua Inglesa mediante el Blogging en el enfoque AICLE en la Enseñanza Secundaria Obligatoria: Estudio del Caso. In J. D. Martínez Agudo, M. G. de la Maya Retamar, & R. Alejo González (Eds.), *Educación Bilingüe a Debate. Práctica, Investigación y Formación del Profesorado* (pp. 52-63). Universidad de Extremadura.

Montaner, S. (2019b). La creciente importancia de la web 2.0 colaborativa en CLIL. In Round Table within the framework of the CIEB 2019 congress, *La Enseñanza Bilingüe hacia la Web 2.0 y Web 3.0*, with J. García-Laborda & C. Calle-Martínez.

Montaner Villalba, S. (2020). *Aplicación del Blogging para mejorar la producción escrita en inglés en el enfoque AICLE en Educación Secundaria Obligatoria en España: Investigación-Acción*. Editorial Académica Española.

Montaner, S. (2021a). Competencia escrita en inglés mediante blogging en AICLE: Análisis del proceso de escritura. In C.M. Gámez-Fernández & L.M. Martínez Serrano (Eds.) *De la emoción al conocimiento: Ecosistemas emergentes de aprendizaje lingüístico* (pp. 87-94). UCOPress.

Montaner, S. (2021b). EFL Written Competence through Blogging within the CLIL Approach: Product Writing Analysis. In S. Montaner-Villalba & A. M. Gimeno-Sanz (Eds.), *Research in Technology-Enhanced Content and Language Integrated Learning (CLIL)* (pp. 57-80). *Verbeia Journal of English and Spanish Studies*, 5. <https://doi.org/10.57087/Verbeia.2021.4397>

Montaner-Villalba, S., & Gimeno-Sanz, A. (2021). (Eds.) *Research in technology-enhanced Content and Language Integrated Learning (CLIL)*. *Verbeia Journal of English and Spanish Studies*, 5, 6-9.

Montaner-Villalba, S. (2022). Using Kahoot in the English lesson within the CLIL approach. In J. J. Magaña-Redondo & S. Montaner-Villalba (Eds.), *Perspectivas del Proceso de Enseñanza y Aprendizaje de Lenguas Extranjeras Asistido por Dispositivo Móvil* (pp. 33-46). *Revista Electrónica del Lenguaje*, IX.

Montaner-Villalba, S. (2025). Enhancing written competence in English for Specific Purposes using Google Docs: A study on Design Engineering students. *EDULEARN25 Proceedings*, 1135-1342. <https://doi.org/10.21125/edulearn.2025.0430>

Muñoz López, L. (2024). CLIL approach through ICT: A didactic proposal for the second grade of primary education. [Trabajo Fin de Máster] Universidad de Jaén.

Redecker, C. (2017). *European framework for the digital competence of educators: DigCompEdu*. Publications Office of the European Union. <https://doi.org/10.2760/178382>

Robin, B. (2016). The educational uses of digital storytelling: Promoting critical thinking, collaboration, and engagement. *Educational Technology Research and Development*, 64(3), 349-365. <https://doi.org/10.1007/s11423-016-9435-7>

Thomas, J. W. (2000). *A review of research on project-based learning*. Autodesk Foundation.

Voogt, J., & Roblin, N. P. (2012). A comparative analysis of international frameworks for 21st-century competences: Implications for national curriculum policies. *Journal of Curriculum Studies*, 44(3), 299-321. <https://doi.org/10.1080/00220272.2012.668938>

Wrobel, M. (2019). Using Google Docs for collaborative writing tasks in the EFL classroom. *Journal of Language Teaching and Research*, 10(2), 412-419.

Wu, J., Pan, Z., & Chen, X. (2020). Virtual reality and augmented reality in education: Exploring teamwork and problem-solving through immersive environments. *Journal of Educational*

Technology Research and Development, 68(4), 845-860. <https://doi.org/10.1007/s11423-020-09789-0>

Zafirov, G., & Spasova, T. (2021). Project-based learning in science education: The role of ICT tools like Google Workspace and Padlet in enhancing individual and group learning outcomes. *Journal of Educational Technology Research and Development*, 69(3), 541-560. <https://doi.org/10.1007/s11423-021-09982-6>

Zainuddin, N., & Halili, S. H. (2016). Flipped classroom research and trends from different fields of study. *International Review of Research in Open and Distributed Learning*, 17(3), 313-340. <https://doi.org/10.19173/irrodl.v17i3.227>

Zayas-Bazán, E., & Fernández-Álvarez, R. (2019). Exploring digital strategies for young learners in bilingual education: Scalability and adaptability in ICT-enhanced CLIL models. *International Journal of Educational Technology in Higher Education*, 16(4), 453-467. <https://doi.org/10.1234/ijet.2019.016453>

Zohar, A., & Dori, Y. J. (2003). Higher order thinking skills and low-achieving students: Are they mutually exclusive? *The Journal of the Learning Sciences*, 12(2), 145-181. https://doi.org/10.1207/S15327809JLS1202_1

CONCEPTUAL REVIEW ARTICLE

Traditional Motor Stories as a Didactic Tool in Primary Education

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RESUMEN (Spanish)

Este artículo de investigación surge a partir de la idea de entrelazar la literatura y la actividad física en el ámbito educativo, en este caso en Educación Primaria.

¿Sería posible esto? ¿Cómo y de qué manera pueden relacionarse?

Pues no solo es posible, sino que resulta necesario para realizar conexiones directas entre el mundo literario y el de la actividad física y corporal, incluso creando una posible relación entre el género novelesco y la expresión física, entre la literatura y el movimiento. A través de este enfoque, se muestran los cuentos motores como una herramienta didáctica efectiva para fomentar tanto el desarrollo físico como el cognitivo de los estudiantes, combinando elementos narrativos y movimientos corporales, potenciando de esa manera la creatividad, comprensión y el bienestar físico, enriqueciendo además un aprendizaje significativo.

Cuando los discentes escuchan y participan en un cuento motor, no solo siguen la narración pasivamente, sino que se convierten en protagonistas activos de la historia que se desarrolla en su mente. Este tipo de cuento permite que el alumnado visualice las escenas y, mediante el proceso, expresen libremente sus emociones y sentimientos, a la vez que libera su energía de manera controlada y estructurada. Así, el cuento motor se convierte en una experiencia liberadora que fomenta la imaginación mientras el niño se relaciona con su entorno y consigo mismo.

Los objetivos del trabajo son, pues, los siguientes: (i) Trabajar la interdisciplinariedad, concretamente la literatura y la actividad física, (ii) conocer y comprender los intereses y expectativas del alumnado en relación con los cuentos tradicionales; y (iii) analizar la influencia de los cuentos motores como un recurso didáctico para potenciar la práctica deportiva y corporal del alumnado de Educación Primaria a través del género literario.

PALABRAS CLAVE

Cuento motor;
actividad física;
herramienta didáctica;
literatura;
interdisciplinariedad

ABSTRACT (English)

This research article arises from the idea of intertwining literature and physical activity in the educational field specifically in Primary Education.

Is this possible? How and in what ways can they be related?

It is not only possible but necessary to establish direct connections between the literary world and physical and bodily activity, even creating a potential relationship between the novel as a genre and physical expression, between literature and movement. Through this approach, motor stories are presented as an effective teaching tool to promote both the physical and cognitive development of students, combining narrative elements and body movements, thereby enhancing creativity, understanding, and physical well-being, while also enriching meaningful learning.

When students listen to and participate in a motor story, they do not merely passively follow the narration; they become active protagonists of the story unfolding in their minds. This type of story allows students to visualize the scenes and, through the process, express their emotions and feelings freely, while releasing their energy in a controlled and structured manner. Thus, the motor story becomes a liberating experience that encourages imagination while the child connects with their environment and themselves.

The objectives are: (i) To work on interdisciplinarity, specifically literature and physical activity; (ii) to know and understand the interests and expectations of students in relation to traditional stories; and (iii) to analyze the influence of motor stories as a didactic resource to enhance the sports and physical practice of Primary Education students through the literary genre.

KEYWORDS

Motor story; physical
activity; didactic tool;
literature;
interdisciplinarity

1. Introduction

The motor story can be used with children at very early ages, as it is a didactic tool that addresses several needs, such as enhancing cooperative work, imagination, and creativity. García and Pérez (2010) believe that a good way to educate and teach is by using the motor story, as it is stimulating and motivating for students, encouraging the development of basic life skills and helping them understand and process emotions and feelings. Moreover, it fosters cognitive, emotional-social development and increases moral values such as respect for others and for oneself.

According to Villegas and García (2010), starting from a motor story, an imaginary scenario can be projected in which students participate together and, through motor activity, interpret the characters of the story, promoting reading and reading comprehension. This allows them to create and write their own motor stories in groups and share them in different sessions with others. In fact, in theater or dramatization, work is done on developing basic psychomotor elements and, coordinative motor qualities, among others (Iglesia, 2008).

On the other hand, Otones (2013) argues that it is crucial to introduce motor stories as a resource in educational centers, considering a number of factors such as the design, creation, and execution of these stories. Therefore, a series of factors must be defined both before and during the storytelling process, such as planning, rehearsal, and available space.

Following Seves (2016), the characteristics of motor stories are presented as follows: The teacher must be familiar with the story to provide the necessary and appropriate materials for carrying out the activity. These stories should follow a structure according to the educational level and stage. Once the motor story ends, the contents worked on are analyzed and questions about the characters are posed through brainstorming or other types of dynamics depending on the activity.

Moreover, stories, tales, fables, and narratives that are part of children's literature are fundamental resources in the educational field (Tabernero, Aliseda, and Daniel, 2016) and promote the development of language in addition to vocal expression, becoming very enriching educational materials.

2. Traditional Tales

According to Pedrosa's (2000) definition, "a traditional tale is a narrative, anonymous, and fictional story passed down orally from generation to generation within the same community or between different communities." Its essential characteristics according to Pedrosa (2000) are:

-Oral style: simplicity, naturalness, and colloquialism in its lexical register; the ritualized nature of its formulaic structure (characterized by clichés at the beginning and end, repetitions, etc.); and the use of expressive resources typical of oral discourse (dialogue, emphasis, etc.).

-Variability: each reproduction of the same tale results in different versions, even if its narrators belong to the same group or family.

-Migratoriness: tales of the same type are often known by different peoples and have been objects of cultural exchange between peoples in contact since ancient times (like myths, legends, songs, ballads, etc.). Indeed, tales have been traditionally transmitted within a single community and between different communities for centuries, mixing, contaminating, and overlapping with previous layers, forming, in each place, a repertoire partly connected with the surrounding environment and partly shaped by its own specific features.

The migration of tales is a phenomenon closely linked to processes of migration, contact, and the mixing of peoples or groups from different communities. Today, it is possible to trace families and branches of the same story motifs spread over vast geographical areas. For example, one can speak of an Indo-European storytelling tradition that shares partially coincident elements across traditions from the Middle East to Great Britain, Spain, Portugal, and all English-speaking (such as the United States) and Spanish-speaking countries (all of Latin America). One can also speak of Semitic, Chinese, Japanese storytelling traditions, and similarly, Germanic, Spanish, Italian, and, on a more specific level, Basque, Galician, Catalan, Andalusian storytelling, or of a particular region or town. In all these traditions, a common multicultural foundation and a specifically local dimension coexist inevitably:

- Temporal and geographical ambiguity: traditional tales often begin with formulas like "Once upon a time... in a faraway land...". This ambiguity sets them apart from myths and legends, which are typically situated in proto-historical or historical times and in places known or related to the community transmitting them.

- Symbolism: the characters in traditional tales are not depicted as individuals with their own psychology, but rather as symbols or archetypes that embody and represent moral values (good or evil), family relationships (parents, children, siblings, lovers, suitors, etc.), social classes and tensions (poor people aspiring to marry rich ones, servants becoming kings), animals, and natural elements depicted in a stereotypical way, etc.

- Entertainment: the tale plays a primary role in leisure and amusement within society, especially among children.

- Endocultural and socializing function: traditional tales often contain a moral lesson or a message of sociocultural affirmation or reinforcement, more or less explicitly. Since ancient times, tales have played a basic role in transmitting human knowledge and culture.

- Pedagogical purpose of traditional tales: Charles Perrault, a key editor of these tales, stated that tales should convey "a commendable and instructive morality. Virtue is always rewarded, and vice is punished. They aim to show the advantages of being honest, patient, discreet, hard-working, and obedient, and the consequences for those who are not."

Numerous critics have interpreted, in any case, that fairy tales are a means of transmitting knowledge and social norms, but also of expressing ways of transgressing them.

- A relatively common phenomenon has been the adaptation and manipulation that certain authors or groups have made of the ideological and moral content of various folk tales, with the goal of aligning them with their own ideological views.

Several critics, such as Rodari (2006), have rejected as disturbing and distorting the alteration of the meanings of tales in order to achieve specific moralizing or didactic applications. And others, such as Bruno Bettelheim (1976), have pointed out that the enculturating and socializing contents of fairy tales are only one of the dimensions of their multidirectional capacity to explain and interpret reality, which would have not only a conscious and intentional dimension, but also a subconscious and unintentional one.

In general, the traditional tale is one of the most powerful tools for developing children's imagination and creativity, since it recreates fictional situations that can be interpreted by any individual, regardless of their abilities. In addition, the tale, as an educational resource, promotes socialization, content learning, and self-knowledge (Pérez et al., 2013). All these characteristics remain in its CM variant. This is a type of symbolic play that allows teachers to develop and refine basic motor skills.

Here is the classification of traditional tales by Gómez (2001):

Classification (Gómez, 2001)

GUIDE TO THE TALE	
1. Animal tales.	a) Wild animals. b) Wild and domestic animals. a) Humans and animals.
1.1. Marvelous tales.	
2. Tales of the fool or the simpleton.	
3. Moral tales.	
4. Religious tales.	a. Clergy. b. Issues of faith.
5. Tales that demonstrate human ingenuity.	
6. Tales of marriage.	a. Faithful wife. b. Unfaithful wife.

Creating this classification, Nieves Gómez has based it on the previous classifications made by the researchers Aarne-Thompson, who developed a classification system for fables or fairy tales. The first edition was the work of the Finnish folklorist Antti Aarne, published in 1910. In 1928, the American folklorist Stith Thompson expanded and completed it, renaming it Aarne-Thompson (AT or AaTH) in its later 1961 version. In 2004, Hans-Jörg Uther continued the work, and it became known as the Aarne-Thompson-Uther or ATU system.

3. The Motor Story

According to Nicolás and Alonso (2021), the motor story can promote the integral development of people, being a methodological tool in the bilingual early childhood classroom. Their approach combines storytelling with motor activities, allowing young children to stimulate not only their imagination but also their bodies and motor skills. Through play in the bilingual preschool classroom, the motor story becomes a methodology that not only enhances children's creativity and imagination in the classroom, but also facilitate the development of fundamental skills in various areas. Students can playfully experience emotions, social interactions, and problem-solving, fostering a learning environment that supports their physical and emotional well-being. The story, combined with physical activity, encourages children to immerse themselves in a narrative context, which not only enriches their reading comprehension but also gives them the opportunity to experience the story in a more lived and sensory way (Ruiz Omeñaca, 2011).

The main benefits of the motor story in the early childhood classroom are:

- Development of basic motor skills: through play and movement, children improve their coordination, balance, and both gross and fine motor skills.
- Stimulation of imagination and creativity: storytelling and the opportunity to act out the characters encourage creativity, allowing children to express themselves in new ways.
- Emotional and social development: children can explore emotions and social situations through the characters and events in the story, learning to relate to their peers and manage their feelings.
- Encouragement of teamwork: motor story activities often require children to work together, improving their skills in collaboration, listening, and respect.
- Facilitation of public expression: as children interact with others, they learn to express themselves effectively, both verbally and through body language.

On the other hand, when creating a motor story, several points must be taken into account:

- All stories reinforce the ability to imagine (Rodari, 2006).
- Before carrying out the motor story, the teacher should work with the students on how to create a story. First, it would be useful to teach the students the words they will most frequently work with in the story and assign a representation that is consistent for everyone. It is important to teach students to experience a motor story as a different and

enjoyable activity. Secondly, the story should be told in a dynamic and fun way. It is not enough to just read it and perform a few gestures; you need to live the story. If you do not believe in it, the children will not believe in it either, and as a result, they will not live it. According to Ventura and Durán (2008), stories give students a special view of the world around them.

- It is advisable, for example, to highlight words in bold in order to work on psychomotor expression. In this way, when we reach a word in bold, the teacher should emphasize the gesture in question even more, so that it is clearly noticeable what the students should perform at that moment.”
- It would be beneficial to dress the students with the necessary costumes at the beginning of the story.
- The execution of the tasks is characterized by giving the students the materials they will use and explaining the way to execute the most characteristic movements, while allowing for free exploration and guided discovery, although the specific objectives to be achieved are not disclosed.

4. Design and Methodology: Didactic Application for Primary Education through a Bilingual Workshop

There are further studies and research experiences on motor stories in the Early Childhood Education stage, such as the one carried out by Vargas-Vitoria et al. (2023), which follows an experimental study protocol to evaluate the effects of an intervention that combines movement + storytelling on fundamental motor skills, language development, and physical activity levels in children aged 3 to 6. The study analyzes and compares the effects of the combined movement and storytelling intervention (CMSI) on fundamental motor skills (locomotor skills and object control), language development (language comprehension, language expression, vocabulary, and language description), and physical activity levels (low intensity, moderate-to-vigorous intensity, and sedentary behavior).

Nevertheless, we have chosen Primary Education to investigate, through classroom experience, the feasibility and educational benefits of motor stories, knowing that fewer studies have been conducted at these ages. We begin from a learning situation, understood as a specific teaching-learning scenario designed for students to develop competencies and acquire specific knowledge. We have designed a workshop aimed at the third cycle of Bilingual Primary Education, specifically for 5th-grade students, which has been carried out in a public and bilingual school in the province of Almería. This educational workshop proposes interdisciplinary work on the traditional story and the motor story, characterized by research, guided discovery learning and teamwork. The workshop technique has been studied, researched, and successfully developed in our view by López (1999), although previously Sánchez and Rincón (1985) also carried out a theoretical-practical study of the language and literature workshop for secondary education, which should not be overlooked. And more recently, López Flamarique, M., Aznárez Mauleón, M., & García del Real, I. (2023). What is invariable or specific about the workshop is that it responds to concrete and precise expressive needs and realities,

although it has a globalizing conception because it affects the entire educational process: it implies a specific way of guiding the class and a considerable change in the role of the teacher.

What is variable in a workshop are the characteristics of the reality to be created and the applicable working technique. In workshops, the teacher is a guide: they help, discuss, explain what is essential, or answer the students' questions. In workshops, the students start from their individual basic knowledge or training and become creators, learners, readers, speakers, etc., seeking references to learn, not to judge or criticize initially. The teacher-student relationship changes: through the workshops, it becomes closer, more personal, which usually leads to better integration among the students themselves. As a result, the teaching-learning outcomes of these workshops are often optimal or positive (personal well-being leads to satisfactory work and results).

Workshops are artisanal, manual in their most elementary sense because they guide us in a specific direction, opposite to the mass production or manufacturing chain. They narrow the work and materialize it, as opposed to intellectual products. Furthermore, they reinforce creativity, personal and group discovery: they capture the sensitivity and emotions of the students, they are motivating. They are an alternative to the existing educational demotivation and tedium, being an enjoyable, participatory, and conversational way that ensures students learn with pleasure and thus progress in the subject.

Theoretical knowledge is not excluded. Rather, it is transformed into something theoretical-practical and contextualized in social life without ceasing to belong to the school curriculum. In other words, the content is learned inductively. They are a means (within a process, an academic year, or a cycle) for the formation of individuals, not an end. Workshops have objectives, techniques to be developed, time, materials, a specified level of educational cycles for which they are intended, and an evaluation that the teacher must set.

The didactic proposal is based, as we have mentioned before, on motor stories, but from the literature of oral tradition. Specifically, we have developed and applied a workshop for 5th-grade students in Primary Education, based on a story and motor game. The participants are 30 students, and the methodology used is guided discovery, with indirect guidance. The students are simply told what the activity will be about, and they must discover how to carry it out on their own.

Title: "The Lemon Tree Flower"

Duration: Ten days, including the collection of stories, selection, and implementation.

Objectives:

- To become aware of their body and its capacity for action.
- To relate to others through bilingual expression and communication.
- To develop basic and general perceptual skills through motor storytelling.
- To develop physical qualities.

- To develop the child's creative capacity, enhancing the development of their imagination and building their cognitive and bilingual skills.
- To respect the established rules and materials.
- To value and accept others.
- To appreciate ancient traditions through the retelling of stories told by their parents, grandparents, or guardians.

Content:

-Conceptual:

- Understanding the various possibilities of the body in different postures and under different stimuli.
- Assimilating different skills and controlling one's own body.
- Understanding traditional oral literature through play and the development of the body.
- Internalizing their body image through activities related to the story.

-Procedural:

- Understanding the space where they will move to carry out the activity.
- Applying students' skills in a play situation.
- Experimenting with bodily movements to perform a simple game situation.
- Experimenting with the ancient story through the practice of the activity.

-Attitudinal:

- Positively valuing traditional oral literature through activities related to the story.
- Respect for such literature and for the traditions of different languages and cultures.
- Acceptance and respect for the rules.
- Acceptance of personal limitations.
- Respect for inequalities and for classmates.
- Respect for different cultures.

-Evaluation:

- Evaluation of the teaching-learning process.
- The evaluation will be done through reflections, checking how the collection process is going, whether students find it difficult, and through a dialogical approach.
- The different activities related to the story will also be evaluated.
- Evaluation of the achievement of the objectives and content.

-Organization:

- The workshop will be conducted on the school playground, as it involves a series of activities that require that space.
- Students will be distributed individually, in pairs, and in groups.

-Materials:

- Materials needed include a couple of balls and some equipment from the gym, such as cones, hoops, or plastic bricks.

Workshop Execution Process:

- Phase 1: Collection.

a) Request that students collect traditional stories and games in different languages that is, stories told by their parents or grandparents.

b) Presentation of the collected stories to the teacher.

- Phase 2: Selection.

a) Selection by the teacher of the bilingual story we are going to work on.

b) The teacher creates various activities related to the story.

- Phase 3: Preparation of activities.

a) The teacher explains to the students what they are expected to do.

b) One of the students is asked to read the story in Spanish and another chosen language, English (narrator).

- Phase 4: Development of activities.

a) The activities are carried out.

b) Finally, we provide brief feedback to see what the students thought of the workshop we conducted.

Once this “theoretical” part of the workshop has been explained by the teacher, we then move on to the development of the story and then to the more practical part: the development of the different activities proposed to the students so that they could relate them to the story.

Activities related to the story:

1. As the students walk around the track, the teacher, using a second language, calls out a number and the students have to form groups with that number of students.

2. Relay Race: students are divided into groups of five. Each member of the group must retrieve a piece of gym equipment and bring it back to their group. The equipment is placed at the opposite end of the field. They take turns to collect the item. The next student

can not go until the previous one returns with the item. This continues until all the equipment is collected.

3. The same relay race groups. Now, one person from each group hides an object, and the others must find it using clues from the person who hid it.

4. Competition by pairs: the students are paired up and positioned in the middle of the field. They must race to retrieve the balls the teacher is holding. The first pair to return with the ball to their spot wins the prize.

5. Target practice contest: the students form a line behind the penalty mark. There is a ball on top of the goalpost. They must try to knock the ball off the goalpost by kicking it with their ball.

6. Finally, a little feedback is given in second language about what you thought of the activities.

5. Expected results

Consequently, an experimental study was carried out to evaluate the effects of an intervention that combines movement and storytelling on motor skills, language development, and physical activity levels in 5th-grade Primary Education students. The results indicate that, through motor storytelling, socioemotional skills such as teamwork, cooperation, and reduced competitiveness can be developed (Andrés et al., 2022).

The hypothesis states that the CMSI ('Combined Movement and Storytelling Intervention') has the potential to generate significant increases in locomotor skills, object control, language comprehension, language expression, vocabulary, language description, and moderate-to-vigorous physical activity levels compared to the control groups.

In the implementation of the workshop 'The Lemon Tree Flower,' a series of highly positive results have been generated, both at the individual and group levels, within the teaching-learning process and the CMSI. Below, the most significant results that have been observed or can reasonably be expected when applying this methodology are detailed:

1. Improved body language and motor skills. Working on the motor story has helped improve basic motor skills, coordination, and body control. Students have demonstrated greater body awareness by having to interpret scenes, perform specific movements, and adapt to the space.

2. Increased motivation and active involvement. The fun and narrative component of the workshop was particularly motivating. Participation was high, and the students showed enthusiasm and willingness to get involved in the activities. The emotional connection with the traditional stories told by their families sparked interest and a sense of belonging.

3. Development of Creativity and Imagination. The workshop format fostered the students' imagination, as it provided them with a free space to interpret, represent, and experiment with their bodies through storytelling. The children developed personal solutions to the motor skills proposed, fostering individual and collective creativity.

4. Promoting cooperation and teamwork. Through group dynamics, relays, and cooperative games, students learned to work as a team, coordinate with others, and assume roles. This improved group cohesion and reduced conflicts during the workshop.
5. Revaluation of traditional oral literature. The use of stories collected from family members has promoted the recovery and appreciation of oral tradition. Students have shown respect and curiosity for ancient stories, recognizing their cultural and emotional value.
6. Improved communication skills. Narrating, listening, and dialoguing has fostered the development of linguistic competence, both oral and comprehension. Feedback sessions have allowed students to express themselves freely, discuss ideas, and share emotions.
7. Development of positive values and attitudes. Respect for rules, acceptance of differences, teamwork, and recognition of others were all aspects reinforced during the workshop. Furthermore, empathy and tolerance were promoted, especially in cooperative and mutual aid activities.
8. Formative Assessment and Self-Reflection. Dialogue-based assessment has facilitated awareness of one's own learning. Students have actively participated in assessing the activities, which has fostered self-reflection and metacognition.

6. Evaluation and Conclusion

There are recent studies that apply the motor storytelling methodology in Primary Education (for example, Ferrer-Trenor & Alt., 2024 or Martos García et al., 2022), which shows that its use is not limited to the early childhood stage. However, much of this research has a practical or pedagogical innovation focus and lacks rigorous experimental designs. Although interest in integrating storytelling and movement in primary school is increasing, solid scientific evidence remains limited, opening a significant opportunity for future research and reviews to further explore this field.

The traditional tale is an effective educational tool for stimulating children's imagination, creativity, and socialization. In addition, it facilitates learning and self-knowledge. Its adaptation into motor storytelling preserves these qualities, becoming a form of symbolic play that contributes to the development of basic motor skills.

Motor storytelling (Ferrer Trenor & Valencia Peris, 2024) combines different areas (motor, cognitive, emotional, and social), thus achieving holistic learning based on values education' in Primary Education. Therefore, it is essential to incorporate workshops and learning situations in Early Childhood and Primary Education classrooms where motor storytelling is the main focus, promoting the integration of educational content, the comprehensive development of students, and motivation for active learning.

In our opinion, the workshop, included within a learning situation, allows students to develop competencies in a practical and experiential way.

This workshop was carried out in the classroom as a practical experience and has managed to achieve the proposed objectives, although, as is normal in this type of activity, student

involvement has been variable: some were particularly participative, while others were less engaged.

The compilation of stories presented certain difficulties at the beginning, as the students only brought games. However, choosing the story to carry out the activities was not complicated, since we only had two. Fortunately, during the last week, a few more stories were added thanks to the students' efforts.

On the other hand, preparing the activities for the motor story was more challenging. Furthermore, it is worth noting that it was the students themselves who gathered both the stories and the games, which increased their motivation and excitement as they saw their work reflected in the activities carried out.

We consider that the students left the class quite satisfied, showing a positive and receptive attitude towards the activities. Therefore, if we evaluate the whole process as a whole, we can say that the students have been involved in it and it has been remarkable. The fact that they were the ones responsible for collecting the motor stories boosted their motivation, which engaged the participants in the project from the beginning. This participation not only fosters commitment but also encourages creativity, responsibility, and interest within the group.

Finally, the use of traditional motor stories as a teaching tool in the Primary Education stage not only facilitates the learning of academic content, but it has also proven to be an effective strategy and contributes to the emotional, social, and moral development of children. Through these narratives, students strengthen their linguistic and motor skills, while also developing social skills, cooperation, empathy, and respect for others.

The emotional component contained in these stories allows for the development of fundamental aspects of emotional development, helping students identify and manage their emotions, as well as internalize values and norms of coexistence. In this sense, motor stories consolidate as an educational and enriching tool, capable of integrating multiple areas of knowledge in a coherent and appealing way for children in Primary Education.

The experience has been highly positive for both the students and the teachers, reinforcing the idea that active, creative, and participatory methodologies like this one can have a very significant impact on the teaching-learning process.

By strategically integrating these stories into the classroom, teachers can provide students with a rich, creative, and meaningful educational experience that fosters their imagination, empathy, and problem-solving skills. Stories allow for the exploration of cross-cutting themes such as diversity, respect, and inclusion. Moreover, they stimulate imagination and creativity, which are essential elements for critical thinking and innovation, so necessary in today's world.

In short, the conscious and planned incorporation of stories in the educational environment (CMSI) will not only enrich the teaching-learning process, but also contribute to the formation of individuals who are more critical, reflective, and capable of facing challenges and problems in various areas of daily life. For all these reasons, it is essential that educators, teachers, and instructors recognize the pedagogical value of children's

literature and use it as a key tool to help transform the classroom into a space for holistic growth.

References

- Aarne A. (1961). *The types of the folktale: A classification and bibliography*. The Finnish Academy of Science and Letters.
- Asín Izquierdo, I. (2024). *Recurso metodológico interdisciplinar en el Grado en Magisterio de Primaria: El cuento motor (Proyecto de innovación)*. Universidad de Zaragoza.
- Bettelheim, B. (1976). *The uses of enchantment: The meaning and importance of fairy tales*. Knopf.
- Conde Caveda, J. L., Conde Caveda, J. & Viciano, V. (2003). *El cuento, motor en la enseñanza de los elementos musicales*. Eufonía.
- Colomer, J. (2000). *Fiesta y escuela. Recursos para las fiestas populares*. Graó.
- Ferrer-Trenor, T., & Valencia-Peris, A. (2024). El cuento motor como recurso para la educación en valores en Educación Primaria. *Revista Española de Educación Física y Deportes*, 438(3), 50-62.
- García Arizaleta, A. (2025). *Motor play as a tool for socio-emotional development in Primary Education* (Trabajo de Fin de Grado). Universidad Pública de Navarra.
- García, B. M., & Pérez M. (2010). Cuento motor “una pizca de magia”. Buenos Aires, Argentina. Recuperado de: <http://www.efdeportes.com/efd149/cuento-motor-una-pizca-de-magia.htm>
- Gómez Domínguez, T., & Ros Ros, C. (2019). Implementación de cuentos motores en Educación Infantil en niños y niñas con y sin discapacidad. *EFDeportes.com*, 24(252).
- Gómez, N. (2001). Proyecto docente. Sin publicar.
- Iglesia J. (2008). Los cuentos motores como herramienta pedagógica para la Educación Infantil y Primaria. *Revista de Comunicación y Nuevas Tecnologías*, 10. <https://dialnet.unirioja.es/servlet/articulo?codigo=2719911>
- López Flamarique, M., Aznárez Mauleón, M., & GarcíadelReal, I. (2023). ¿Cómo planifica y revisa el alumnado de primaria? Un estudio de caso de una tarea de escritura colaborativa. *Didáctica. Lengua y Literatura*, 35, 113125. <https://doi.org/10.5209/dill.81810>
- López Valero, A. (1999). *La competencia comunicativa. Un aprendizaje cooperativo a través de talleres*. Servicio de Publicaciones de la Universidad de Almería.
- Lucas-Moreira, D. L., Viejo Mora, L. I., & Sánchez Saquisari, J. A. (2025). Cuerpo, movimiento y lenguaje: La literatura como herramienta de motivación en la educación física y el deporte. *Retos*, 68, 388–399. <https://doi.org/10.47197/retos.v68.114953>
- Martínez I. C., & Carrasco L. (2022). Adquisición de competencias multimodales del docente en formación a través del diseño y elaboración de cuentos motores. Una experiencia en el contexto universitario. *Retos: nuevas tendencias en educación física, deporte y recreación*, 43, 958-962.
- Martos García, D., Monforte, J., Espí Monzó, B., Atienza Gago, R., Valencia-Peris, A., & Garcia-Puchades, W. (2022). El cuento motor como recurso didáctico provocativo para fomentar la cooperación y la empatía. *Retos*, 44, 936-945.

- Mishra, R., Klapwijk, R. M., de Vries, M. J., & Spandaw, J. (2025). Story book driven design for enhancing spatialability in earlychildhood: A lesson study approach. *International Journal of Technology and Design Education*, 36(1), 7-40. <https://doi.org/10.1007/s10798-025-09986-x>
- Nicolás Belmonte, C., & Alonso Roque, J. I. (2022). El cuento motor como estrategia educativa para el desarrollo del salto y los desplazamientos en el aula de Educación Física Infantil. *Acción Motriz*, 27(1), 32-45.
- Otones, R. (2013). *Los cuentos motores en infantil*. (Trabajo Fin de Grado). Facultad de Educación de Segovia, Valladolid, España. Recuperado el 29 de abril de 2017 de <https://uvadoc.uva.es/bitstream/10324/3199/1/TFG-B.232.pdf>
- Pedrosa, J. M. (2000). *Enciclopedia Universal Micronet*. Madrid.
- Rodari, G. (2006). *Gramática de la fantasía* (6.ª edición). Planeta.
- Romero Calonge, S. (2019). *El cuento motor como recurso didáctico en Educación Física*. (Trabajo de Fin de Grado, Universidad de Valladolid). UVaDOC.
- Tabernero Sánchez, B., Aliseda García, B., & Daniel Huerta, M. J. (2016). ¿Jugamos a los cuentos? Una propuesta práctica de animación a la lectura a través de la Educación Física. *Retos*, 29, 216-222.
- Thompson, S. (1955-1958). *Motif-index of folk literature: A classification of narrative elements in folktales, ballads, myths, fables, mediaeval romances, exempla, fabliaux, jest-books and local legends*. Indiana University Press.
- Thompson, S. (1972). *El cuento folclórico*. Universidad Central de Venezuela.
- Uther, H. J. (2004). *The types of international folktales. A classification and bibliography, based on the system of Aanti Aarne and Stith Thompson*. Suomalainen Tiedeakatemia-Academia Scientiarum Fennica.
- Vargas Vitoria, R., & Carrasco Sánchez, L. (2006). El cuento motor y su incidencia en la educación por el movimiento. *Pensamiento Educativo*, 38(1), 108-124.
- Vargas-Vitoria, R., Faúndez-Casanova, C., Cruz-Flores, A., Hernández-Martínez, J., Jarpa-Preisler, S., Villar-Cavieles, N., González-Muzzio, M. T., Garrido-González, L., Flández-Valderrama, J., & Valdés-Badilla, P. (2023). Effects of Combined Movement and Storytelling Interventionon Fundamental Motor Skills, Language Development and Physical Activity Level in Children Aged 3 to 6 Years: Study Protocol for a Randomized Controlled Trial. *Children*, 10(9), 1530. <https://doi.org/10.3390/children10091530>
- Ventura, N., & Durán, T. (2008). *Cuentacuentos: una colección de cuentos para poder contar* (2.ª edición). Siglo XXI de España Editores, S. A.
- Villegas, F., & García A. (2010). *El cuento motor como recurso para el desarrollo del currículo en el area de Educación Física*. [Blog]. <http://www.efdeportes.com/efd147/el-cuento-motor-en-educacion-fisica.htm>
- Sánchez, J. & Rincón F. (1985). *Los talleres literarios: una alternativa didáctica ak historicismo*. Editorial Montesinos.
- Seves, Y. (2016). La animación a la lectura a través de los cuentos motores. *Revista digital de Educación Física*, 39, 111-122.

SYSTEMATIC REVIEW ARTICLE

A general guide to the teaching-learning of suprasegmental features (stress and rhythm) of English pronunciation in a Spanish secondary education bilingual context

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RESUMEN

Este artículo analiza la importancia de la enseñanza de la pronunciación en la adquisición del inglés como segunda lengua, que ha ido ganando importancia con el tiempo en relación con diferentes metodologías y enfoques pedagógicos. Sin embargo, los rasgos suprasegmentales (especialmente la acentuación y el ritmo) no siempre han recibido la atención que merecen, teniendo en cuenta que el objetivo principal del aprendizaje de una lengua es la comunicación eficaz. Además, se ha demostrado que estas características desempeñan un papel crucial en la inteligibilidad. No obstante, los métodos, estrategias y materiales más eficaces para enseñar la acentuación y el ritmo siguen siendo objeto de investigación. Por tanto, el objetivo principal es explorar la importancia de estas características de la pronunciación para desarrollar estrategias eficaces y prácticas para su uso en el aula. Este proceso de enseñanza y aprendizaje se guiará por la metodología del Aprendizaje Integrado de Contenidos y Lengua Extranjera (AICLE), sin perder de vista el enfoque integrador adaptado a las necesidades del alumnado de la educación secundaria bilingüe.

PALABRAS CLAVE

Pronunciación;
Rasgos
suprasegmentales;
Acentuación;
Ritmo;
Contexto bilingüe

ABSTRACT

This article examines the importance of teaching pronunciation in the acquisition of English as a second language, which has been gaining importance over time in relation to different teaching methodologies and approaches. However, suprasegmental features (especially stress and rhythm) have not always received the attention they deserve, considering that the main aim of learning a language is effective communication. Furthermore, it is proven that these features play a crucial role in intelligibility. Nevertheless, the most effective methods, strategies, and materials for teaching stress and rhythm are still subjects of ongoing research. Therefore, the main aim is to explore the significance of these pronunciation features to develop effective and practical strategies for classroom use. This teaching and learning process will be guided by the methodology of Content and Language Integrated Learning (CLIL), without losing the focus of an integrative approach tailored to the needs of students in bilingual secondary education.

KEYWORDS

Pronunciation;
Suprasegmental
features;
Stress;
Rhythm;
Bilingual context

1. Introduction

Nowadays, English is acknowledged to be the most widely spoken language in the world. In fact, "one out of five people can speak or at least understand English" (Nishanthi, 2018, p. 871). According to this author, the main driver of this fact was British imperialism and the dissemination of English throughout the colonies, which shows that these days "67 countries have English as their official language and there are 27 countries that have English as their secondary official language" (Nishanthi, 2018, p. 871). Consequently, it is impossible to ignore its significance in many aspects of our daily life: understanding other cultures, acquiring new knowledge, engaging in business, travelling, and education, among others. Thus, learning English can now be seen not just as a benefit, but as a necessity. In this context, according to Lorenzo et al. (2009), many European countries have begun to implement the pedagogical approach called Content and Language Integrated Learning (CLIL) due to the importance of

developing language competence, particularly in English, alongside disciplinary content mastery. Moreover, they would argue that

most European states are currently implementing bilingual type programmes in national education. The abundance of new initiatives suggests that this represents more than just a quantitative increase of second language provision in schools. The change now is pervasive and the foundations appear to be set for European multilingualism—the social phenomenon of multiple languages in social groups, and European plurilingualism—an ample language repertoire amongst a majority of individuals, which should enable students not only to *savoir* but also to *savoir faire* and *savoir être* in a reconfigured continental environment. (pp. 418-419)

Although CLIL has proved to offer students and teachers a wide range of positive outcomes, such as “necessary linguistic support to students, facilitation in the learning of content, and consolidation of the linguistic structures of the language of instruction and of other languages” (Pavón, 2014, p. 124), there is a language area that is often overlooked: pronunciation. In Spain, educational legislation concerning the teaching of EFL/ESL does not address how pronunciation and its teaching and learning process should be guided, leaving this responsibility to teachers (Fernández and Hughes, 2009). Furthermore, these scholars also highlight that, in the field of pronunciation, practice is often centred on repeating individual sounds at the segmental level, and the same approach is applied to the practice of longer segments at the suprasegmental level. Consequently, students may struggle to effectively develop the “key competence of oral communication and spoken interaction” (Fernández and Hughes, 2009, p. 105).

There should be no division between the importance of segmental and suprasegmental features, as pronunciation should be seen as an integrated aspect of the language rather than two separate elements. That said, it is also true that “native listeners rely on stress patterns much more than on segmental features and that incorrect stress patterns will render the speaker’s utterance unintelligible even if the speaker has appropriate consonant production” (Wang, 2022, p. 194). This area of pronunciation is often overlooked because, as Hussain and Sajid (2015) note, EFL teachers find suprasegmental features challenging, both to teach and learn, despite knowing their crucial role in communication, and therefore they treat them as “peripheral frills” (p. 3).

In light of the above, this research will focus on assessing and developing didactic strategies and tools mainly based on the practice and teaching of the prosodic features of stress and rhythm in a bilingual context, addressed to secondary education, with the necessary adaptations for each level. Content and Language Integrated Learning (CLIL) will serve as the primary pedagogical approach, as it is currently the most widely implemented in bilingual education settings. First, we will address the importance of pronunciation in the EFL/ESL teaching context, the beneficial influences it may exert on learners, and the issues and challenges that arise when it is not taught and learnt effectively, particularly regarding intelligibility in communication. Moving on to a more detailed analysis of pronunciation, we will also highlight the significance of the target suprasegmental features of this paper, stress and rhythm, in the acquisition of ESL/EFL, for they are tightly connected to oral

comprehension and intelligible spoken production, or, in other words, successful communication.

2. Importance of teaching-learning pronunciation

Any human language might be acquired and transmitted through speech or writing. In the natural process of learning a language, we are first exposed to oral input and, therefore, listening and speaking skills precede reading and writing (Crystal, 2019). This procedure is also extended in the teaching of English as a second language and, therefore, one of the main factors that should be considered is the acquisition of a major “intelligible” pronunciation. As Hişmanoğlu (2006) has observed, “since sounds play an important role in communication, foreign language teachers must attribute proper importance to teaching pronunciation in their classes” (p. 102). Moreover, Wang (2022) supports the former by asserting that “suprasegmentals should be given priority in PI [pronunciation instruction] as they have a greater impact on intelligibility” (p. 195).

However, it is commonly acknowledged that EFL/ESL teachers have not focused enough on the explicit teaching of pronunciation in the classroom despite being fostered by the current curriculum. Some scholars, such as Brown (1991), point out that “pronunciation has sometimes been referred to as the ‘poor relation’ of the English language teaching (ELT) world. It is an aspect of language which is often given little attention, if not completely ignored, by the teacher in the classroom” (p. 1).

As a consequence of their inadequate pronunciation, it is found that most students do not feel confident when uttering the language in order to avoid mistakes. This may lead to reluctance to speak up in class (Prodanovska-Poposka, 2017) and, as a result, to a standstill in their development of oral production. Moreover, their main objective of learning the language to communicate would be unsuccessful. Another problem is that teachers encounter a lack of available resources they can trust in the classroom as for the purpose of teaching pronunciation.

According to Dalton and Seidlhofer (1994), pronunciation can be defined in two different ways: on the one hand, “as the production and reception of sounds of speech” (p. 3) and, on the other hand, pronunciation can be understood in relation to acts of speaking, which involve the speaker’s intention and its effect on the hearer. In this way, sound production is “significant because it is used to achieve meaning in contexts of use” (p. 3). Additionally, Taylor (2002) asserts that “the phonology of a language is grounded in the human ability to produce, perceive, and above all, categorize sounds, and to form mental representations of sounds” (pp. 79-80). From all this, we should conclude that the main goal of learning pronunciation is successful oral communication in the target language, which is English in our case. For an English utterance to be understood, Jenner (1989) proposed a set of features common to all native speakers that enable them to communicate despite having different accents. Therefore, these are the main principles, which he termed “Common Core”, that any EFL student should consider for the sake of intelligibility:

- The distinction between long and short vowels.

- If there is no correspondence between the phoneme of a consonant in English and any of the source language, the student should associate it to a similar sound in their own language.
- The phonetic production is another strategy to achieve a correct pronunciation. As a result, the student attempts to pronounce a similar sound in their mother tongue, although sometimes it might not lead to success and lead to unintelligible chunks instead.
- Students tend to simplify consonant clusters.
- Coordination of stress in speech is important for the distinction of weak and strong forms, for example dealing with vowels sounds.
- Speech cannot be interrupted randomly, so rhythm is also considered in the production of the language.
- Contrastive stress, a key aspect of English, together with a correct intonation are essential for the accurate meaning of the utterance.

Teachers should concentrate on addressing these seven points so that students can attain full communicative competence. In fact, according to Wong (1993), students often make mistakes because they expect a one-to-one correspondence between sounds and their spelling, as their approach to pronunciation has not been sufficiently addressed in the classroom. Furthermore, this scholar claims that encouraging learners to work on their English pronunciation will positively influence and support other skills such as grammar, spelling, listening comprehension, and reading.

2. Importance of the teaching-learning of pronunciation

In bilingual secondary education schools, the recommended approach is CLIL (Content and Language Integrated Learning). Since most regulations in Spain are regional, two online regulations will be used as references. These are the *Andalusian Information Guide for Bilingual Education Centres* (2013) and the Resolution issued for implementing the CLIL programme in the Canary Islands for the 2024-2025 academic year. According to both, the main features characterising this methodological approach (CLIL) in classroom implementation are:

- Usage of methodological strategies that foster functional and integrated learning. These strategies include Project-Based Learning (PBL), the design of school projects involving the entire educational community, as well as cooperative and collaborative learning, and Task-Based Learning (TBL).
- The teaching process is student-focused, relevant to them, and involves applying the L2 to the study of other subjects. This will depend on the level and goals of the teaching-learning process, but the main aim is to teach and learn both the L2 and the target subject in an integrated manner.
- Lessons are contextualised within the subject taught, dealing with a specific topic that links English linguistic skills to the subject's area. This implies that teachers from different subjects need to cooperate to work collaboratively.
- Usage of different materials and resources, especially TICs.

- Lesson plans are organised regarding the joint ideas among the subjects or disciplines, their integration and common core elements.
- As for the role of teachers, CLIL promotes teamwork, and it contributes to the pooling of ideas to develop activities and techniques.
- It considers the difficulties that learning a subject in the L2 might entail for students. This would explain the use of different tools for planning the learning process, as well as the integration of multiple situations where content is revised and repeated to reinforce learning.

Nowadays, most of our current methodologies and approaches to EFL teaching are based on those developed at the end of the 20th century. The principles of Content-Based Instruction (CBI) are heavily rooted in the principles of the Communicative Approach, which is also closely related to CLIL since both consider (Jaén, 2016) the following elements:

- The integration of language and content throughout the process of language acquisition, as well as the integration of the four skills is of paramount importance in both principles.
- The use of language in context, that is, in a way that is useful and didactic to students, for example, in relation to another subject, for the study of cultural aspects, etc. Therefore, this will foster learners' motivation.
- The role of the student as essential in the context of the classroom.
- The integration of authentic material for a successful and satisfactory learning process.

Nevertheless, there are other factors that differ between CBI and CLIL. Dalton-Puffer and Smit (2013) point out that, frequently, CLIL teachers are usually non-native speakers, as opposed to CBI teachers. However, CLIL encourages the cooperation and coordination between the content teacher (of the target subject) and the language teacher (English) for those aspects that learners might find more difficult. Moreover, in these programs, language assistants play a crucial role, particularly in helping content and language teachers develop areas such as vocabulary and, more importantly to this article, pronunciation.

Conversely, the fact that the importance of bilingual instruction lies in content over form implies that aspects such as syntax, writing, informal or non-technical language, pronunciation, or pragmatics remain unaffected or indeterminate by CLIL (Dalton-Puffer, 2007, p. 5). This reinforces the previous ideas discussed in section 2., "Importance of the Teaching-Learning of Pronunciation": the insufficient attention given to teaching pronunciation, despite clear evidence that it is vital for intelligibility, communication, and successful English oral production.

Based on research by Rallo and Jacob (2015), a group of FI students and another group of CLIL students were examined in terms of "temporal measures of fluency along with phonemic errors" (p. 173). These were the results:

The results of the vowel error analysis showed that CLIL learners' pronunciation of English vowels was not significantly better than their FI peers'. Neither group of learners showed any improvement after 2 years of CLIL-based instruction. These results raise the question of whether 2 years of content-based instruction are sufficient to have a direct impact on learners' pronunciation. Furthermore, it should be highlighted that CLIL instruction in this case does not include specific activities to

enhance students' discrimination of English sound contrasts or activities aimed at practicing pronunciation. (p. 174)

Therefore, considering the above outcomes, in both contexts, students' needs mainly focus on practising and learning pronunciation, along with increasing the time and quality dedicated to oral input in the classroom. Consequently, the strategies and tools developed in this research will incorporate these suggestions to apply the most effective techniques and tasks for the acquisition of ESL pronunciation in the bilingual classroom.

3. Stress and rhythm in English communication

According to Solé (1991), the teaching of English pronunciation has traditionally focused on the study of segmental features, that is, phonetic or phonological details such as phoneme sequences or contrasts. Therefore, the aspects of the suprasegmental level—such as stress, rhythm, and intonation—along with larger speech units like whole words, phrases, or sentences, have been neglected and deemed less significant.

To deconstruct the previous idea and explain why, we will analyse in this section the roles of stress and rhythm in relation to English communicative purposes, emphasising their importance, characteristics in context, and how they influence intelligibility for ESL learners, particularly Spanish students. An initial statement made by Solé (1991) is that

[a]n appropriate stress and rhythmic pattern is more important for intelligibility than the correct pronunciation of isolated segments and, in fact, stress and rhythm determine the pronunciation of segments in English. Stress and rhythm are suprasegmental aspects that give the overall shape to the word or sequence. If easy intelligibility is to be achieved, it is important to give words their correct accentual pattern and rhythm. (p. 145)

Building on this same area of research, it has also been demonstrated that teaching prosodic or suprasegmental aspects to improve listening and speaking skills with communicative goals promotes students' mastery and confidence in SLA contexts (Zhang, 2004). Simultaneously, this facilitates the acquisition of appropriate verbal communication skills, which are accompanied by a good level of intelligibility.

First of all, both stress and rhythm are prosodic features that shape the form of words or sequences of words, meaning they are the "backbone of English pronunciation" (Solé, 1991, p. 147). Pavón (2017) further explains this by stating that stress and rhythm are crucial elements in pronunciation because they affect syllables and the sounds that make up spoken language syllables.

4.1 Stress or accentuation

Regarding stress or accentuation, the primary elements of these suprasegmentals are pitch and stress, alongside quality and duration (Finch & Ortiz Lira, 1982):

- Pitch is defined as the degree of highness or lowness of a note from a perception perspective, while, articulatorily (referring to production), it involves the tension and the way the vocal folds vibrate when producing the sound.
- Stress, also known as intensity according to Collins and Mees (2013), from the speaker's perspective, involves the energy used to produce a sound, requiring greater effort to release air from the lungs. From the listener's point of view, this results in what is perceived as loudness, which can vary from soft to loud.
- Quality relates to how the resonators shape the breath when it is spoken, leading to modifications in the sound's quality. This explains why we perceive two sounds with the same pitch but differing in duration and stress.
- Duration, quality or length refers to "the property of the sound that enables us [...] to place it on a scale going from long to short" (Finch & Ortiz Lira, 1982, p. 88).

Phonetically, the realisation of segments will be directly linked to the stress position, for instance in the case of vowel quality: in a stressed syllable, the vowel will preserve its full vowel quality whereas in an unstressed position, the vowel quality will be reduced to /ə/ or the reduced vowels /i/, /u/ (Solé, 1991). For example, this would be the case of emission /ɪ'mɪʃən/ regarding its first and last unstressed syllable, or the distinction between record as a noun: /'rɛkɔ:rd/ or as a verb: /rɪ'kɔ:rd/.

Table 2. Characteristics of stressed and unstressed syllables.

	<i>Stressed</i>	<i>Unstressed</i>
1 Intensity	Articulation with greater breath/muscular effort Perceived as greater loudness	Less breath/muscular effort Perceived as having less loudness
2 Pitch	Marked change in pitch	Syllables tend to follow the pitch trend set by previous stressed syllable
3 Vowel quality	May contain any vowel (except /ə/) Vowels have clear (peripheral) quality Diphthongs have clearly defined glide	Generally have central vowels /ə ɪ ʊ/ or syllabic consonants Vowels may have centralised quality Diphthongs tend to have a much reduced glide
4 Vowel duration	Vowels have full length	Vowels are considerably shorter

Note. Retrieved from *Practical Phonetics and Phonology*, by Collins and Mees, 2013, p. 130. Routledge.

As Collins and Mees (2013) indicate, different types of stress in a word can be distinguished: primary, which is the strongest and is marked by a vertical mark ['] placed just before the main stressed syllable (,expla'nation); the next level is secondary accent, which is weaker than primary stress but stronger than unstressed syllables and is indicated by this symbol [,], as seen in our example: ,expla'nation. Finally, lack of stress is not indicated, and these syllables are generally known as *unstressed*.

Ambalegin and Afriana (2023) claim that “English word stress is like English pronunciation that is inconsistent” (p. 24), because there are no fixed, established rules for students to learn. However, correct stress can be acquired and demonstrated through listening and practice, especially since Spanish is a syllable-timed language and English is a stress-timed language. For Spanish ESL students, stress does not come naturally; therefore, exposure to English speech production from both receptive (listening) and productive (speaking) perspectives is necessary.

4.2 Rhythm

According to Celce-Murcia et al. (1996), in order to perform the rhythm of an English utterance, word stress and sentence stress are combined. Therefore, it is argued that stress is highly rhythmical and tends to have a regular beat (Solé, 1991). Following Finch and Ortiz Lira (1982), rhythm can be defined as “the way in which accented and unaccented syllables follow each other in the utterance” (p. 115). These scholars also highlight that there is a principle to bear in mind when considering English rhythm, called isochrony or, in other words, equality in timing, which means that accented syllables are separated by equal time intervals. A consequence of this principle led Reed and Levis (2015) to classify languages into two groups: those with a stress-time rhythm, on the one hand, and those based on syllable-time rhythm, on the other.

Due to the reasons outlined above, English is recognised as a stress-timed language because accented syllables are separated by unaccented ones, and the time interval between each accented syllable remains roughly the same. For this to happen, unaccented syllables are compressed and sped up to maintain a regular rhythm and spacing between stressed syllables (Finch and Ortiz Lira, 1982). An example to illustrate this is the following sentences, where rhythm patterns (also known as “feet” or “rhythm units”) are marked with “□” for accented syllables and “_” for unaccented syllables (Pavón, 2017, p. 6):

'How many 'were there? → [□ _ _ □ _]

'How many more 'were there? → [□ _ _ _ □ _]

'How many more of those 'were there? → [□ _ _ _ _ □ _]

In all these sentences, the two words that are stressed are “how” and “were”, and the time taken to pronounce from the first one to the second one is roughly the same, although we encounter more unaccented syllables separating them in the last two examples.

Conversely, Spanish is regarded as a syllable-timed language since, in this case, “it is the syllables, either accented or unaccented, which tend to occur at a more or less regular intervals” (Finch & Ortiz Lira, 1982, p. 115). Thus, what characterises Spanish unstressed syllables is that they are weakened and shortened to a slight extent. In contrast, one feature derived from the English rhythmical principle of isochrony is the existence of full forms and weak forms. The former are “stressed for rhythmical, emphasising or contrastive reasons,” while the latter are “used when the word is unstressed and must be fitted between stresses”

(Solé, 1991, p. 155). For example, the auxiliary verb “do” in these examples can be stressed, maintaining its full form, or unstressed, which means it appears in its weak form.

'Yes, I 'do (stressed; full form: /du:/).

'What do you 'want? (unstressed; weak form: /də/).

In this context of the bilingual secondary school classroom, students will be guided to learn English from a global perspective, for that would encourage them to widely communicate when travelling abroad or meeting people from other countries. This implies that if “learners aspire towards a globalist orientation[,] then stress-based timing should be taught” (Low, 2015, p. 133). Nevertheless, instructors should also introduce the concepts of stress-based and syllable-based languages so that students can make their own decisions on how to approach English as an International Language: from a global or from a localist perspective (p. 134). At the same time, this will also help learners to understand the difference between the rhythm of their L1, Spanish, and the L2, English.

Given that rhythm is a vital feature for native English speakers, since their mother tongue is stress-based, Low argues that teachers should emphasise the practical implications when native speakers shift from stress-based to syllable-based timing to avoid misunderstandings in high-stakes cross-cultural communication, such as in educational or business contexts (p. 133). For that purpose, showing several examples of utterances in English and Spanish to illustrate the differences between both languages might help students, first, to recognise how speech varies between the languages; second, to practise English rhythm to modulate their voice correctly in the L2; third, to understand the pragmatic differences through different realisations of the same speech.

5. Pedagogical implications: factors and principles

Gilakjani (2012) claims that the first aspect to bear in mind for integrating English pronunciation into teaching and learning processes is how the curriculum addresses this issue. This means teachers need to clearly determine how they will develop their lesson plans and how students will work towards achieving the main goals outlined by the curriculum. According to this author, for a programme to be effective in emphasising the importance of pronunciation within the curriculum, these are the factors that should be considered:

1. Learners' profile, including aspects such as their age, their level, their educational context, their prior knowledge and experiences dealing with pronunciation acquisition and their motivation in the learning process.
2. Instructional settings are worth considering, which means whether we are dealing with a compulsory or optional classroom environment: language academy, school, university, or a specific job, for instance.
3. Institutional aspects are also relevant, including the previous instructor's experiences in the teaching environment, the curriculum's focus, the materials and equipment available for lesson development, and the size of the classroom, among other factors.

4. Another outstanding feature is the linguistic variables involved, namely the learner's mother tongue and whether there is diversity among the students in relation to this aspect.
5. The last variable relates to the methodology or approach that the program adopts.

Furthermore, recognising the lack of precision and uncertainty about how pronunciation should be integrated into the classroom, Levis and Grant (2003) propose a set of principles to guide teachers through this process. These principles are based on the idea that the main goal of teaching pronunciation, to be effective, must link speech features with their corresponding communicative functions rather than concentrating on irrelevant tasks or neglecting to provide context for their realisation.

The first principle they establish aims to focus on suprasegmental features, though not exclusively. This assertion was based on research by McNerney and Mendelsohn (1992), who argued that a good command of rhythm, stress, and intonation (suprasegmentals) is more influential for correct intelligibility than that of segmentals. Moreover, it is also believed that suprasegmentals are more prominent in speaking skills because they deal with connected speech and its meaning, rather than just isolated words.

The second principle entails primarily focusing the lesson on speaking skills. In this context, it is essential to consider that "a pronunciation syllabus should begin with the widest focus and move gradually in on specific problems" (Firth, 1992, p. 173). Furthermore, pronunciation is consistently understood and taught with an emphasis on speaking, for its production, and listening, for its acquisition. Additionally, it is important to recognise that learners often find it challenging to incorporate the newly learned pronunciation features into meaningful communication. Therefore, it is crucial to contextualise the primary didactic objectives of the lesson within the framework of oral communication (Levis and Grant, 2003).

The final principle deems the nature of speaking tasks to which students are exposed. If these are scheduled activities, such as presentations, they offer an appropriate opportunity to incorporate instructions related to the teaching and learning of pronunciation, given the need for extensive preparation. Conversely, if the tasks are based on spontaneous communication, meaning they are unplanned, learners should still receive guidance temporarily, and pronunciation should be regarded as a tool for effective utterance production. Overall, both formal, pre-planned activities and informal or more neutral, unplanned tasks should be supported by the teacher's guidance in pronunciation (Levis and Grant, 2003).

6. Strategies, tasks and materials for the teaching of stress and rhythm

Below, Morley (1991) provides an overview of the major changes in theoretical paradigms encountered across various methodologies and approaches in the teaching of ESL. They are:

- Firstly, the learner has become an active agent in the learning process, thus leading to a new understanding of the language acquisition process.

- The second change stems from the first and shifts the focus from “the group” during the teaching process to a more individual approach centred on personal strategies and customised learning styles.
- Another change involves shifting from viewing language solely as a formal system to seeing it as a combination of a formal and functional system. This approach highlights the communicative objective of the learning process, making it essential.
- New disciplines were introduced, such as pragmatics, semantics, discourse, and speech act theory. Consequently, the sole focus was no longer limited to sentence-level grammar.
- The focus shifted from instructional goals and linguistic structure to functional purpose and communicative objectives. Therefore, the primary aim was centred on communicative competence rather than purely linguistic aspects.
- The final modification pertains to the specific competences, which are focused on linguistic and pedagogical aspects, in contrast to the overarching or general competences outlined in previous stages. This revised conception encompasses grammatical, sociolinguistic, discourse, and strategic competences.

This means that every aspect of the English teaching and acquisition process has been affected, including pronunciation, which remains our primary concern. This suggests that pronunciation is no longer taught as a set of fixed, established rules but as an integral part of communication. In fact, it is worth noting that the previous pronunciation coursebooks often focused mainly on sound discrimination related to segmental features (Wei, 2006). However, all elements essential for an accurate pronunciation pedagogy include, besides vowels and consonant phonemes, intonation, stress, and rhythm (that is, suprasegmental features).

Additionally, this section will primarily address material, tasks, and strategies associated with stress and rhythm. According to Firth (1992), these are some key questions necessary for selecting the appropriate material, both at word and sentence levels:

Can the students use loudness and length to differentiate between stressed and unstressed syllables? Can the student produce the schwa sound in unstressed syllables? Can the students use dictionaries to check stress patterns? [...] Is the student incorrectly stressing every word of a sentence equally? Is he/she able to produce appropriate strong and weak stresses? Are content words stressed and function words unstressed? Is the student placing major sentence stress on the appropriate words? Is the student linking words appropriately within sentences? (pp. 176-177)

Based on Fangzhi’s research (1998), Wei (2006) provided teachers some general advice on choosing materials to instruct learners’ pronunciation (p. 14):

1. “Providing meaningful materials”. This could include exercises contextualised in specific situations that entail an active participation of the students, for example: extracts of dialogues, pair words, etc., so that they feel their practice is relevant and useful to their process of acquiring English. Moreover, teachers can select different items of a wide variety of styles from the textbook they are using for the subject.

2. "Using songs, games and, tongue twisters". This is connected to the factor of motivation; the more entertaining and appealing the practice is to students, the more motivated they will be.
3. "Assessing students' progress". This will help maintain our students' motivation, not just by providing them with appropriate feedback, but also by appreciating and reminding them of every aspect they are successfully achieving.

As for specific strategies, tasks, and some illustrative examples dealing with stress and rhythm, Lin, Fan, and Chen (1995) made the following division (pp. 6-9):

1. Word stress, which included visual elements, rubber bands and tapping, clapping, or playing instruments in order to practice rhythm.
 - As for visual aspects, the stressed syllables could be highlighted using capital letters, in bold, underlining it or using a different colour from the rest of the syllables. For instance: *HOLiday*, **h**oliday, holiday, *h*oliday.
 - When using the rubber band, students need to hold it with both hands, and the aim is to stretch it while pronouncing the stressed syllable of the word so that they can notice the difference between stressed and unstressed syllables.
 - The aim of clapping, tapping or using instruments is to emphasise the stressed syllables using these tools, thus giving them a strong beat which will be distinguished from the other syllables receiving a weaker beat. The sequence of stressed and unstressed syllables will also be marked by the rhythm they follow in their realisation.
2. Sentence stress. There are two main strategies:
 - The first step involves identifying content words, which will be taught by helping students understand the basic English pattern and demonstrating that content words usually receive the main stress. Afterwards, they will need to mark the words they believe are stressed, either by underlining or circling them, and emphasise these words when pronouncing the sentences.
 - The second strategy involves using rhymes when the rhythm of a sentence is introduced. For example: *Plicky Eater, FUssy Plicker.*
3. Linking. V. Pavón's frequently repeated class statement, "words go together like wagons on a train" (personal communication, 2017) must be clearly explained and conveyed to our students from the very beginning. There are various teaching techniques to demonstrate this, such as using visual depictions with pictures to connect words in a sentence or phrase, or curved lines to link words. For instance:

easy-peasy task   *or stand up* 

Jussain and Sajid (2015) propose other techniques for teaching suprasegmentals that can be quite helpful to students, such as "using nonsense syllables" to demonstrate complex intonation patterns, or to use slowing and speeding up speech as a method to enhance fluency; "back chaining" to practise the rhythm in connected speech, or "shadowing" so that learners attempt to follow the recorded voice and, as sound diminishes, they work independently (p. 4). This challenges students, as they are forced to keep up with the speed and fluency of native speakers.

Besides textbooks, sheets, and physical materials, we now rely on online resources due to technological advances, which offer a wide variety of materials and tasks for daily pronunciation teaching in the classroom. Referring back to stress and rhythm practice, this section will offer some examples.

Resources created by scholars such as Mark Hancock and Annie McDonald: <http://hancockmcdonald.com/>. Here, there are different sections where we can select the level of the students, the intended audience and the focus, which in our case will be pronunciation. The main advantage of this webpage is that all the resources are free, and there is open access to teachers' notes, images, audios, and video files. Besides, there is a brief description for each activity, so, for example, there is one called "Pronunciation Journey", addressed to A2 upwards level students, and the main points it tackles are:

- "Pronunciation: unstressed final syllables"
- "Distinguishing similar sounding words"

Another instance of exercise, intended for C1 level students, would be the one titled "Blues Band":

- "Listening Skills"
- "Music"
- "Authentic Listening"

Several online resources are provided by Oxford University Press: <https://elt.oup.com>. These materials are available for both learners and teachers. There is a section called "catalogue" where the level can be selected, the age of the students, the kind of accent (American or British), the skills we want to practice and the main focus of our interest (in our case, pronunciation). Once we choose the suitable options for our context, several options of apps courses and textbooks are given; some are free while others require special access available for teachers or can be bought. For example, we can select a pronunciation practice textbook called *New Headway Pronunciation Course: Upper-Intermediate* by Bill Bowler, Sarah Cunningham, Peter Moor and Sue Parminster (2002), and the key features that define it are:

- "Language Level: Elementary to Upper-Intermediate"
- "Sounds and spelling"
- "Stress and intonation"
- "Connected speech"

Authentic material based on real-life contexts can also be found. These resources are typically designed for intermediate and upper levels, with pronunciation practice being implicitly taught through real-life situations. Therefore, students learn how to produce stress and rhythm correctly through listening and assimilation. For instance, the public service broadcaster BBC (The British Broadcasting Corporation) offers access to any news report or article on topics such as culture, health, politics, etc.: <https://www.bbc.com/>. Another advantage of this webpage is that these materials are constantly updated. On the other hand, although it was previously pointed out that these resources are normally addressed to upper-intermediate learners (B2), and advanced and proficiency students (C1 and C2), the webpage called Simple English News (<https://www.simpleenglishnews.com/>) also offers an

opportunity to beginners, elementary and intermediate students (A1, A2 and B1) to practice with easier audio reports and transcripts.

Moreover, tools that use artificial intelligence can help teachers develop activities adapted from the aforementioned materials and others, thus enabling them to tailor the content to the students' level and needs, as well as the instructions and classroom dynamics.

7. Conclusions

Various studies emphasise the importance of teaching pronunciation in the classrooms of our bilingual secondary schools to enhance communication and intelligibility. Moreover, within the field of pronunciation, the aspects that have been mainly neglected are found at the suprasegmental level: stress, rhythm, and intonation, despite the fact that extensive research, as shown in this article, has highlighted their significance for successful communication, such as the enhancement of listening and speaking skills, or the construction of comprehensible utterances in oral connected speech.

One of the main learning barriers faced by Spanish students of English as a second language is that their language is syllable-timed, whereas English is stress-timed. This means that the rhythm of speech varies markedly, which they need to learn and understand early on in their learning process to begin working on the prosodic aspects of English. Another challenge in teaching this aspect of the L2 is that, as Hussain and Sajid (2015) point out, teachers struggle with teaching the suprasegmental features of the language and also find the learning process difficult.

At the same time, this article sheds light on the lack of guidance, strategies, and materials available to instructors for properly teaching suprasegmental aspects of English in classrooms. It therefore concludes that there is a legislative need to include this element of L2 teaching in Spanish curricula. This could serve as a foundation for further research that might expand on information related to this educational issue.

Furthermore, numerous strategies and materials can be implemented in the classroom to support the teaching and learning of suprasegmentals. To this end, a systematic review has been conducted, and available materials and resources have been compiled to serve as a guide—such as criteria for selecting materials, practical examples of strategy application, and online resources. These can also be adapted to meet the specific needs of our students' profiles. Similarly, confidence and motivation are also strengthened when the learning process is positively influenced and involves authentic communicative contexts, where pronunciation, especially suprasegmental features, forms the foundation for creating coherent and effective discourse.

References

- Ambalegin, A., & Afriana, A. (2023). How to perform English word stress on English pronunciation. *Anaphora: Journal of Language, Literary, and Cultural Studies*, 6(1), 14–27. <https://doi.org/10.30996/anaphora.v6i1.8714>.
- BBC. (n.d.). BBC. <https://www.bbc.com/>.
- Bowler, B., Cunningham, S., Moor, P., & Parminter, S. (2002). *New Headway Pronunciation Course: Upper-Intermediate*. Oxford University Press.
- Brown, A. (1991). *Teaching pronunciation: A book of readings*. Routledge.
- Celce-Murcia, M., Brinton, D., & Goodwin, J. M. (1996). *Teaching pronunciation: A Reference for Teachers of English to Speakers of Other Languages*. Cambridge University Press.
- Collins, B., & Mees, I. M. (2013). *Practical Phonetics and Phonology: A Resource Book for Students* (3rd ed.). Routledge.
- Consejería de Educación, Formación Profesional, Actividad Física y Deportes del Gobierno de Canarias. (2024). *Resolución de la Dirección General de Ordenación de las Enseñanzas, Inclusión e Innovación por la que se dictan instrucciones para el desarrollo del Programa de Aprendizaje Integrado de Lenguas Extranjeras (AICLE) en Canarias para el curso 2024-2025*. https://www3.gobiernodecanarias.org/medusa/procedimientos/wp-content/uploads/formidable/6/resolucion_411_2024_aicle_24_25.pdf.
- Crystal, D. (2019). *The Cambridge Encyclopedia of the English Language*. (3rd ed.). Cambridge University Press.
- Dalton, C., & Seidlhofer, B. (1994). *Pronunciation*. Oxford University Press.
- Dalton-Puffer, C. (2007). Outcomes and processes in Content and Language Integrated Learning (CLIL): Current research from Europe. In W. Delanoy & L. Volkmann (Eds.), *Future perspectives for English language teaching*. Carl Winter. https://www.academia.edu/837745/Outcomes_and_processes_in_content_and_language_integrated_learning_CLIL_current_research_from_Europe.
- Dalton-Puffer, C., & Smit, U. (2013). Content and language integrated learning: A research agenda. *Language Teaching*, 46(4), 545–560. <https://doi.org/10.1017/S0261444813000256>.
- Fangzhi, C. (1998). The teaching of pronunciation to Chinese students of English. *Forum: A Journal for the Teacher of English Outside the United States*, 36(1), 37–39.
- Fernández, D. M., & Hughes, S. (2009). Student teacher perceptions of pronunciation tasks in Andalusia. *The Buckingham Journal of Language and Linguistics*, 2, 105–125. <https://doi.org/10.5750/bjll.v2i0.12>.
- Finch, D. F., & Ortiz Lira, H. (1982). *A course in English phonetics for Spanish speakers*. Heinemann Educational Books.
- Firth, S. (1992). Pronunciation syllabus design: A question of focus. In P. Avery & S. Ehrlich (Eds.), *Teaching American English pronunciation* (pp. 173–183). Oxford University Press.
- Gilakjani, A. P. (2012). A study of factors affecting EFL learners' English pronunciation learning and the strategies for instruction. *International Journal of Humanities and Social Science*, 2(3), 119–128. http://www.ijhssnet.com/journals/Vol_2_No_3_February_2012/17.pdf.
- Hancock, M., & McDonald, A. (2018). *Hancock McDonald: English language teaching*. <http://hancockmcdonald.com/>.

- Hişmanoğlu, M. (2006). Current perspectives on pronunciation learning and teaching. *Journal of Language and Linguistic Studies*, 2(1), 101–110. <http://jlls.org/index.php/jlls/article/viewFile/26/28>.
- Hussain, S., & Sajid, S. (2015). Applications of suprasegmental in EFL classroom: A short review. *International Journal of Scientific and Research Publications*, 5(9), 1–7. <https://www.academia.edu/download/79141218/ijsrp-p4552.pdf>.
- Jaén, M. (2016). *Redefining the roles of the EFL teacher within CLIL secondary settings* (Master's thesis, Complutense University of Madrid). Complutense University of Madrid. https://eprints.ucm.es/44937/1/TFM_Marta%20Ja%C3%A9n2.pdf.
- Jenner, B. (1989). Teaching pronunciation: The common core. *Speak Out!*, 4. IATEFL.
- Junta de Andalucía, Consejería de Educación. (2013). *Guía informativa para centros de enseñanza bilingüe*. https://www.juntadeandalucia.es/export/drupaljda/Guia_informativa centros ense%C3%B1anza bilingue .pdf.
- Levis, J., & Grant, L. (2003). Integrating pronunciation into ESL/EFL classrooms. *TESOL Journal*, 12(2), 13–19. <https://doi.org/10.1002/j.1949-3533.2003.tb00125.x>
- Lin, H.-P., Fan, C.-Y., & Chen, C.-F. (1995, May 20). *Teaching pronunciation in the learner-centered classroom* (Paper presented at the 12th TEFL Conference, Taichung, Taiwan). ERIC. <http://files.eric.ed.gov/fulltext/ED393292.pdf>.
- Lorenzo, F., Casal, S., & Moore, P. (2009). The effects of Content and Language Integrated Learning in European education: Key findings from the Andalusian bilingual sections evaluation project. *Applied Linguistics*, 31(3), 418–442. <https://doi.org/10.1093/applin/amp041>.
- Low, E.-L. (2015). The rhythmic patterning of English(es): Implications for pronunciation teaching. In M. Reed & J. M. Levis (Eds.), *The handbook of English pronunciation* (pp. 125–138). Wiley-Blackwell.
- McNerney, M., & Mendelsohn, D. (1992). Suprasegmentals in the pronunciation class: Setting priorities. In P. Avery & S. Ehrlich (Eds.), *Teaching American English pronunciation* (pp. 185–196). Oxford University Press.
- Morley, J. (1991). The pronunciation component in teaching English to speakers of other languages. *TESOL Quarterly*, 25(3), 481–520. <https://doi.org/10.2307/3586981>
- Nishanthi, R. (2018). The importance of learning English in today world. *International Journal of Trend in Scientific Research and Development*, 3(1), 871–874. <https://doi.org/10.31142/ijtsrd19061>
- Oxford University Press. (2020). Oxford University Press. <https://elt.oup.com/>.
- Pavón, V. (2014). Enhancing the quality of CLIL: Making the best of the collaboration between language teachers and content teachers. *Encuentro: Revista de Investigación e Innovación en la Clase de Idiomas*, 23, 115–127. <http://hdl.handle.net/10017/21615>.
- Pavón, V. (2017). *English phonology/pronunciation: Accentuation, rhythm and intonation* [Unpublished class handout]. Department of English and German Philology, Faculty of Philosophy and Letters, University of Córdoba.
- Prodanovska-Poposka, V. (2017, March 22–24). A study of proper pronunciation as a factor of successful communication. *CBU International Conference Proceedings*, 5, 778–779. <https://doi.org/10.12955/cbup.v5.1024>

- Rallo, L., & Jacob, K. (2015). Does CLIL enhance oral skills? Fluency and pronunciation errors by Spanish-Catalan learners of English: Discussion. In L. Rallo & K. Jacob (Eds.), *Content-based language learning in multilingual educational environments* (pp. 163–177). Springer.
- Reed, M., & Levis, J. (2015). *The handbook of English pronunciation*. Wiley Blackwell.
- Simple English News. (2020). *Simple English News*. <https://www.simpleenglishnews.com/>.
- Solé, M. J. (1991). Stress and rhythm in English. *Alicante Journal of English Studies*, 4, 145–162. <https://doi.org/10.14198/raei.1991.4.13>.
- Taylor, J. (2002). *Cognitive grammar*. Oxford University Press.
- Wang, X. (2022). Segmental versus suprasegmental: Which one is more important to teach? *RELC Journal*, 53(1), 194–202. <https://doi.org/10.1177/0033688220925926>.
- Wei, M. (2006). *A literature review on strategies for teaching pronunciation* (Doctoral dissertation, University of Maryland at College Park). University of Maryland. <https://files.eric.ed.gov/fulltext/ED491566.pdf>.
- Wong, R. (1993). Pronunciation myths and facts. *English Teaching Forum*, 31(4), 45–46.
- Zhang, L. J. (2004). Awareness-raising in the TEFL phonology classroom: Student voices and sociocultural and psychological considerations. *International Journal of Applied Linguistics*, 145(1), 219–268. <https://doi.org/10.2143/ITL.145.0.562915>.

CONCEPTUAL REVIEW ARTICLE

Fostering and Assessing Creativity in Content and Language Integrated Learning (CLIL): A Conceptual Overview

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RESUMEN

Esta revisión conceptual examina cómo se comprende, se fomenta y se evalúa la creatividad en los contextos de Aprendizaje Integrado de Contenidos y Lenguas Extranjeras (AICLE). A partir de estudios publicados entre 2010 y 2025, sintetiza investigaciones que exploran el papel del pensamiento creativo. Si bien el AICLE ofrece un entorno prometedor para la creatividad gracias a la integración de contenido, comunicación, cognición y cultura, la creatividad suele tratarse como un resultado indirecto y no como un objetivo pedagógico central. Basándose en las teorías de la creatividad (por ejemplo, Sawyer, 2012; Beghetto, 2013), la revisión sostiene que la creatividad no es un acto repentino de inspiración reservado a unos pocos estudiantes, sino un proceso susceptible de aprenderse apoyado en el andamiaje y la reflexión, que se alinea con los enfoques centrados en el alumnado. Integrar la creatividad de forma más explícita en las prácticas AICLE puede potenciar el desarrollo lingüístico y cognitivo. No obstante, la escasa atención a la evaluación de la creatividad, así como la falta de materiales sobre cómo fomentarla dentro y fuera del aula, representan desafíos que aún deben explorarse en mayor profundidad.

PALABRAS CLAVE

AICLE;
Brecha de creatividad;
Evaluación de la
creatividad;
Pedagogía;
Pensamiento crítico y
creativo

ABSTRACT

This conceptual review examines how creativity is understood, fostered, and assessed within Content and Language Integrated Learning (CLIL) contexts. Drawing on studies published between 2010 and 2025, it synthesizes research which explores the role of creative thinking. While CLIL provides a promising environment for creativity through its integration of content, communication, cognition and culture, creativity is often treated as an indirect outcome rather than a central pedagogical aim. Building on creativity theories (e.g., Sawyer, 2012; Beghetto 2013), the review argues that creativity is not a sudden act of inspiration that is special to a handful of students but a learnable process supported by scaffolding and reflection that aligns with learner-centered approaches. Integrating it more explicitly into CLIL practices can enhance linguistic and cognitive development. However, limited attention to assessment of creativity as well as materials on how it can be fostered in and out of classrooms are some of the challenges that are yet to be further discovered.

KEYWORDS

CLL;
Creativity assessment;
Creativity gap;
Critical and Creative
Thinking;
Pedagogy;

1. Introduction

CLIL (Content and Language Integrated Learning) has emerged over the past few decades as a dynamic approach to language education, combining the simultaneous development of subject knowledge and language proficiency. As CLIL gains more attention, the area of research also grows. While much research focuses on language acquisition and subject-area learning, there is a lot to be discovered when it comes to the potential of fostering creativity within the classroom. Often defined as the ability to create new ideas, creativity is increasingly recognized as a crucial skill in the 21st-century educational landscapes. In recent decades, there is a growing interest in creativity within the scope of education (Craft, 2005; Huang et al., 2019; Smith & Smith, 2010). Creativity proves itself to be important due to the empirical evidence which shows the positive contribution of creativity to academic and social outputs (Gajda, Karwowski, & Beghetto, 2017; Hansenne & Legrand, 2012).

Creativity has always been a growing field, even in psychology, as the research concerning creativity alone has been very little compared to the rest of the research on psychology (Sternberg, 1999, p. 4). There are several definitions of creativity, one of the most common definitions of creativity appears in the 1950s. According to Guilford (1950), creativity is divided into two criteria: originality and appropriateness. Creativity is commonly related to words such as “imagination” and “originality”. However, as we keep diving deeper into creativity, it gets increasingly difficult to further define what it truly is, especially in the context of education. It is often thought that creativity is a talent that one either has or not. With its close relation to the arts, creativity is often related to the prodigies of the arts. According to a very common belief between educators and psychologists, learning and creativity should be kept together as “knowledge and creativity are two sides of the same coin, not opposing forces” (Boden, 1990, p. 99).

The present work aims to present a conceptual review of the literature on the intersection of CLIL and creativity. The aim is not to measure effects but to identify theoretical trends, pedagogical practices, and research gaps within this ever-growing field. The works used in this review were chosen between 2010 and 2024. Foundational works published prior to 2010 (e.g., Guilford, 1950; Torrance, 1974) were included selectively for theoretical grounding. The search terms were: CLIL AND creativity, CLIL AND higher-order thinking skills, creativity AND emotion AND learning, creativity AND education, CLIL AND creativity AND assessment. Additional parameters included that the sources would be in English. The analytical process followed thematic synthesis (Thomas & Harden, 2008), which involved three iterative stages: (1) familiarization with the material and extraction of key arguments, (2) categorization of findings under thematic areas (conceptualization, pedagogy, and assessment), and (3) synthesis of emerging insights into a cohesive framework highlighting consistencies, tensions, and underexplored directions.

The research questions include:

1. How has creativity been conceptualized and addressed within existing CLIL research and practice?
2. What pedagogical strategies and assessment approaches have been proposed or implemented to nurture creativity in the classroom?

2. Conceptual Review and Findings

2.1 Defining CLIL and the Theoretical Underpinnings

CLIL has become an influential approach to bilingual and plurilingual education in Europe and beyond over the past few decades. Unlike conventional subject teaching in L2, where language tends to be a secondary consideration, CLIL pursues both objectives of simultaneously developing the subject knowledge and language proficiency (Coyle, Hood, & Marsh, 2010, p. 1). Unlike the traditional language education in EFL and ESL settings where the focus is on grammatical progression, CLIL places language learning within content-driven contexts, enabling students to use language for critical thinking and problem-solving (Dalton-Puffer, 2011).

There are different conceptualizations of what CLIL is and what it involves. As Coyle claims, “there is a lack of cohesion around CLIL pedagogies. There is neither one CLIL approach nor one theory of CLIL” (2008, p. 101). This flexibility of CLIL has made it particularly attractive for European contexts, as there was a need for enhancing second language education (Marsh 2002, p. 11). However, the lack of cohesion also brings counter arguments that, due to its lack of precision, it is difficult for CLIL to evolve in a pedagogically coherent fashion (Cenoz, Genesee, and Gorter 2014, p. 5). At the same time, this plurality is frequently described as a source of pedagogical creativity and innovation, encouraging teachers and curriculum designers to experiment with different task types, scaffolding strategies, and assessment approaches (Banegas, 2021, p. 4). This also opens CLIL as a ground for embedding skills such as creativity, collaboration and critical thinking since it supports a context-sensitive design. As Dooly mentions, “the two common axes to all of these 21st-century competences (creative and critical thinking, collaborative skills, problem-solving abilities, social skills and communicative skills) are language and knowledge” (2018, p. 4).

CLIL often follows the 4Cs framework, which comprises Content, Communication, Cognition and Culture (Coyle, 1999) and aims to offer teachers a guide to better plan and implement their lesson plans (Meyer, 2010, p. 12). However, this is where we might consider some difficulties in CLIL as finding or creating materials that focus on all 4Cs at the same time proves to be a difficult task for teachers. Different research that focuses on student skills show that some CLIL students possess poorer writing skills (Vollmer, 2008). Other studies have shown that productive language skills such as speaking are not promoted in many CLIL lessons (Dalton-Puffer, 2007). This brings about one of the biggest issues that CLIL faces today, the lack of available materials that can support both students and teachers. Coyle

points to this issue of materials by also bringing a focus to the "very few ready-made CLIL materials available" (Coyle et al., 2010, p. 228).

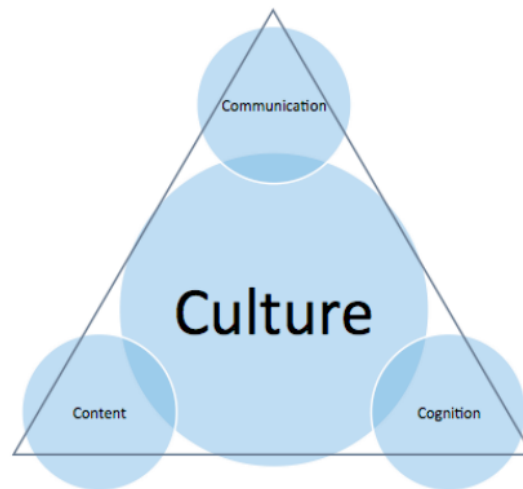


Figure 1. The 4Cs of CLIL. Coyle et al. (20...)

According to Meyer (2010), appropriate classroom materials should follow three main criteria: meaningful, challenging, and authentic (p. 13). As for curriculum design, one of the most influential and most cited frameworks in CLIL is Bloom's Taxonomy (Bloom, 1956), which offers a hierarchical classification that categorizes cognitive processes from low-order thinking skills (LOTS) to high-order thinking skills (HOTS). The six initial categories were later revised by Anderson and Krathwohl (2001) as follows: remember, understand, apply, analyze, evaluate, and create. The first three (remember, understand and apply) are LOTS, while the remaining three (analyze, evaluate and create) are HOTS. Most often, the tasks found in textbooks follow a progression from LOTS to HOTS as they start on a simpler level of understanding and gradually move towards more challenging tasks. In other words, incorporating Bloom's Taxonomy into the design of CLIL textbooks involves creating tasks that require students to apply this knowledge in new contexts, analyze the information, evaluate different approaches and create original ideas or solutions.

Although Bloom's Taxonomy seems to be the desirable framework for the content of CLIL textbooks, it may not always be effectively integrated. Research on CLIL materials has shown that there is an imbalance between the integration of LOTS and HOTS (González, 2011; Czura, 2017; Banegas, 2014). According to these, there was a higher promotion of LOTS in most textbooks used in CLIL teaching. Research conducted by Romeu Peyró et al. (2020) highlights that there is often a focus on lower-order thinking skills, but not on higher-order thinking skills. In other words, the results display the insufficient development of creative and critical

thinking in CLIL classrooms.

2.2 Unpacking Creativity

Creativity has been the subject of different research across various disciplines, including psychology, sociology, education and cognitive science. Creativity has recently gained more popularity both in psychology and especially in education. Creativity is defined as originality and appropriateness (Kaufman 2016, p. 5). This definition has been universally accepted, although research has added other determiners. Thus, Boden (2004) and Perkins (2000) suggest *surprise* as the third criterion, whereas Sternberg (2002, p. 6) suggests *quality* to be part of the other two components. Although there might be different ideas of what creativity should be, they all meet under the same conclusion that it leads to something new being produced.

Other discussions on creativity suggest different conceptualizations. Kozbelt et al. (2010) group creativity theories into ten categories: developmental, psychometric, economic, stage and component process, cognitive, problem-solving and expertise, problem-finding, evolutionary, typological, and system theories. Another way of looking at creativity is to focus on the level of its expression. Beghetto and Kaufman (2014) proposed the Four C Model, defined as Big-C, Pro-c, Little-c and mini-c. Big-C refers to genius-level creativity, only available to special people who have a significant impact (e.g., Mozart). Pro-c refers to professional creativity, those who are experts in their field. Little-c is everyday creativity where the average person might think the product is new. In mini-c, the emphasis is placed on the individual and the personal meaning of the creative idea (Kaufman, 2016, p. 18). It is most often used in educational contexts. The product created might not be something completely new and original, but it is still useful and meaningful to the student.

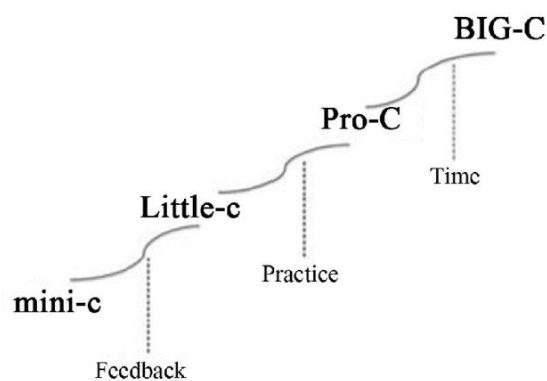


Figure 2. *The Developmental Trajectory of Creativity (Beghetto & Kaufman, 2014)*

A common challenge when it comes to creativity, whether in psychology or education, arises from the fact that it is subjective. The different definitions of creativity make space for different instruments in order to measure it accordingly (Said-Metwaly et al., 2017, p. 243). One widely known measuring tool of creativity is the Torrance Test of Creative Thinking (TTCT; Torrance, 1966, 2008). These tests assess various aspects of creativity including frequency, flexibility, originality, and elaboration. Fluency refers to the ability to produce numerous ideas, flexibility to the variety of ideas, originality to the uniqueness of the ideas, and elaboration to the level of detail in the ideas. In an educational setting, the assessment of creativity lags behind the assessment of “hard skills” like reading and mathematics (Long et al., 2022, p. 288). Nonetheless, there is a growing recognition of the importance of nurturing creativity in students. Different organizations and education systems have started to implement programs and assessments of creativity (Chu et al., 2017). Furthermore, “The Partnership for 21st Century Skills” (P21) also includes creativity as one of the “Four Cs” alongside critical thinking, communication, and collaboration.

2.3 Creativity in CLIL and Educational Practice

As already mentioned, creativity is a unique concept that is highlighted in multiple fields. Creativity in the teaching context is multi-dimensional and therefore involves a range of factors which may be pedagogical, social and affective, as well as purely cognitive (Hafner et al., 2017). However, creativity is often related to the Arts. There is a distinct hierarchy between subjects that are taught at schools: at the top are Mathematics, Languages, and Sciences; then comes the Humanities, such as History and Geography; and at the bottom are the Arts (Robinson, 2011, p. 60). This hierarchy causes the Arts, and in turn creativity, to be overlooked. The Australian Curriculum, for example, confined the Arts to a specific area of the curriculum, and then not as a focus until the second phase of development (ACARA 2010; Cross, 2012). This feeds into the common misconception that creativity is only for “special” people or prodigies. Yet, as Carter observes, creativity can be understood in its broadest, most democratic sense “not as a capacity of special people, but as a special capacity of all people” (2004, p. 13).

In recent decades, interest in creativity within the field of education has expanded exponentially (Craft, 2005; Huang et al., 2019; Smith & Smith, 2010). This growth is not accidental. The accumulated empirical evidence points to the wide range of benefits thanks to creativity across academic and social domains. Studies show that creativity positively influences scholastic performance (Fanchini, Jongbloed, & Dirani, 2019; Freund & Holling,

2008; Gajda, Karwowski, & Beghetto, 2017; Hansenne & Legrand, 2012), and is associated with broader indicators of life success (Sternberg, 2002). Various other research has also shown positive relations between bilingualism and creativity. According to some research, there is an advantage among bilingual learners over monolingual learners when it comes to their creativity levels (Bialystok, 2005). Another research has shown better mathematical creativity in bilingual groups (Leikin, 2012).

Cross (2012, p. 431) argues that CLIL can provide “a space for creative pedagogical engagement” where learners can make meaningful choices about which language(s) to use, how to use them, and how to engage with content. CLIL’s dual focus on language and content naturally creates situations of cognitive challenge and linguistic flexibility, both of which are core conditions for creative thinking. Dooly (2012) further highlights that, if designed intentionally, CLIL lessons can nurture critical and creative thinking by encouraging learners to recognize and develop their own reasoning processes, seek and articulate evidence, and arrive at coherent, well-argued conclusions. This resonates with the broader literature on critical thinking and creativity. As Scoot et al. (2004) claim, creative thinking is highly dependent on cognitive processes such as a working memory, the ability to create new mental categories, and mentally manipulating objects.

Several authors have attempted to capture the features of creativity in educational contexts. Maley (2017, p. 87–89), for instance, identifies elements such as *newness* (novelty, originality, surprise), *experiment* (curiosity, exploration, problem-solving), *seeing relationships* (connections, synthesis, metaphor), *constraints* (working within rules and conventions), and *flow* (intense engagement, timelessness). Within the CLIL classroom, these insights take on a particular significance. Because the learners must work between the intersection of language and content, creative tasks often emerge through the application of HOTS. Producing results for these cognitively more challenging tasks in the target language not only requires content knowledge and linguistic competence but also imagination, flexibility, and the ability to make connections. Communicative competence itself — the ultimate goal of language education (Bachman & Palmer, 2010) — is not achieved through the rote teaching of forms but through **creative acts of** meaning-making.

One of the most controversial challenges in education, whether it is standard or CLIL-mediated bilingual education, is the topic of assessment. When thinking of assessment in education, one of the first ideas that comes to mind is standardized testing, such as exams with multiple choice or essay-like questions. The main challenge in CLIL assessment arises

in the attempt to identify what the purpose of assessment is to begin with (Coyle et al., 2010) – in other words, whether the priority should be to assess language or content. A study by Otto and Estrada (2019) shows that most CLIL teachers place content knowledge above language when assessing students' performance in CLIL settings.

Similarly, assessment proves to be a difficult topic in the field of creativity. Despite the common agreement on the importance of creativity in education, assessment of creativity in education (CIE) has lagged behind assessments of "hard skills" such as reading and mathematics (Long et al. 2022). Additionally, creativity assessment is often avoided in classrooms due to the belief that it is too subjective (Lucas et al., 2013). Another study by Runco shows that students exhibited more creativity outside of the school (Runco et al., 2017). Although there are certain tools for measuring creativity such as TTCT, there seems to be a major gap in CLIL pedagogy on how to assess creativity in the classroom.

2.4 The Emotional Dimension of Creative Learning

One of the recurrent themes in CLIL pedagogy is the role of personalization in the learning process. As Coyle et al. (2010) explain, personalization allows learners not only to access content knowledge, but also to "make sense of it through their own perspectives" (p. 129), thereby transforming learning into a process of creating meaning rather than merely receiving information. As Ball, Kelly, and Clegg argue, "CLIL is most effective when it positions learners as co-constructors of knowledge rather than passive recipients" (2015, p. 42), and personalization is central to that shift. Marsh (2002) also highlights this learner-centered orientation, noting that CLIL emphasizes making content personally relevant, meaningful, and motivating as a way to sustain engagement.

Personalization, however, is not only a cognitive matter, but it is also deeply tied to emotion. Neuroscientific research indicates that memory is selective: the brain tends to discard information perceived as irrelevant or incomprehensible (Wolfe, 2006, p. 36). As Immordino-Yang and Damasio (2007, p. 3) explain, the high-level cognitive skills taught in schools are grounded in emotional functions. Educational studies confirm this: positive emotions have been found to increase mental effort, motivation, and satisfaction, while also enhancing learners' perception of instructional material (Um, Plass, Hayward, & Homer, 2012, p. 485). Phelps confirms that "events that elicit emotional responses are more readily remembered" (2004, p. 199), highlighting the importance of designing emotionally engaging learning environments.

The connection between **emotion and creativity** is particularly significant. Fredrickson's

(2001, p. 220) broaden-and-build theory argues that positive emotions broaden the momentary thought-action repertoire, expanding the range of ideas and actions that come to mind. However, creativity is not only fueled by positive emotions. As Eisner (2003, p. 343) emphasizes, art allows human beings to express meanings that are otherwise inexpressible, it creates opportunities to use and develop our mind in distinctive ways through different mediums, and it creates the quality of experience called *aesthetic*, which makes things even more memorable.

This intersection between creativity, emotion and learning highlights why opening up spaces for creativity across the curriculum is so crucial. Thus, artistic and creative engagement should not be confined to traditionally “creative” disciplines. As Sawyer (2012, p. 5) argues, creativity is not confined to the arts but is a core skill of learning itself, essential for problem-solving, effective leadership and teaching more efficiently. The difficulty here arises not from asking “why” but from asking “how”. The belief that creativity is only for those who are talented enough is one of the biggest reasons why we, essentially, fear trying to be creative. This can be evidently seen in schools. As Robinson puts it, “young children enter pre-school alive with creative confidence; by the time they leave high school many have lost that confidence entirely” (2011, p. 49). Sawyer (2012) shares a list of “beliefs” when it comes to creativity and the first of the list states “creative people get their great ideas in a flash of insight” (p. 12). As Sawyer also emphasizes, other research has shown that creativity is a process that can be nurtured through deliberate practice and learning experience (Baer & Kaufman, 2005; Beghetto, 2013). Thus, if creativity is teachable, it should not be treated as an incidental by-product of content and language integration, but as a deliberate pedagogical goal. Sternberg argues that “creativity is a habit, and the best creativity is the result of good work habits” (2010, p. 225), highlighting that structured opportunities for practice are key. As Cross indicates, CLIL can provide “a space for creative pedagogical engagement” (2012, p. 431) in which learners can have opportunities to make creative choices on how to learn and how to use the content. However, it is essential to create the said opportunities for the students through carefully designed tasks, scaffolding, and teacher support. Without intentional planning, the potential for creativity may remain untapped, as learners might fall back on rote memorization.

2.5 Fostering Creativity in the Classroom

Developing creativity in the CLIL classroom requires more than the occasional imaginative

tasks. It should be incorporated into everyday learning activities (Beghetto, 2013) instead. It must be an essential part of the classroom practices rather than being an isolated element. This idea essentially works very well with the nature of CLIL pedagogies, which aim to promote deeper cognitive engagement, as different learning tasks such as reading, writing, or painting can provide students with opportunities for developing creativity (Pang, 2015). However, it is much easier said than done, as creativity does not arise from nothing. Anderson and Krathwohl (2001) define the “create” stage of learning as “putting elements together to form a novel, coherent whole or make an original product” (p. 30). This presupposes that learners must first remember, understand, apply and analyze before they can create, echoing Bloom’s hierarchical model. As Pang (2015) exemplifies, “when students learn a new word, they remember its pronunciation, understand its meaning, compare it with its synonyms, and finally they can use it to create a novel sentence” (p. 124).

Research suggests that creativity is an essential part of learning and emphasizes its importance. Thus, Henriksen (2021) advocates for the exploration of creative risk-taking in educational settings, suggesting that such practices can lead to deeper learning experiences. Creativity in CLIL also supports students in sense-making where the aim of CLIL is not only acquiring knowledge, but also the learner creating their own knowledge and understanding through personalized learning (Coyle, et al. 2010, p. 129). This idea is further supported by Cross (2012), who argues that learning should be understood not merely as being taught, but as actively “creating and refashioning tools based on one’s own foundation for sense-making” (p. 442).

As emphasized by Coyle, Hood and Marsh (2010), CLIL classrooms should foster cognitive engagement through challenge, as higher-order thinking skills naturally support creative outcomes. CLIL’s dual focus on language and content can also promote creative outcomes by encouraging learners to think about how they are thinking (Dooly, 2018), thereby fostering metacognition, which is a key driver of creative reasoning (Kozbelt, Beghetto, & Runco, 2010). It is also important to understand that in order for creativity to flourish, the classroom atmosphere must be allowing (Renzulli, 2002). The environment is crucial for risk-taking and imaginative engagement, as one of the issues with the lack of creativity in classrooms is related to unsupportive school atmospheres (Hennessey, 2004) as well as misconceptions on what it means to be a creative student (Plucker, Beghetto, & Dow, 2004).

Fostering creativity in CLIL involves both linguistic and conceptual creation shaped by the learner’s personal, cultural, and emotional context. In order to recognize this potential, we

must be intentional with our approach towards the integration of this skill. Creativity flourishes not only isolated within a classroom, but within ecosystems that value innovation, experimentation and collaboration (Sawyer, 2012). According to Sternberg (2016, p. 355), creativity is a habit and, as any other habit, it can be encouraged or discouraged. If the goal is to foster creativity in CLIL classrooms, we need to embrace it as one of its core aims.

3. Results and Implications

The existing literature on CLIL has expanded significantly over the past two decades. The wide range of available studies address the effects on language acquisition, cognitive development, and subject specific literacies. The relationship between CLIL and critical thinking has also seen major growth and creativity often receives some attention within the same topic. Although the relation between CLIL and creativity has received less systematic attention (Cross, 2012), this does not necessarily imply an absence of interest but rather that creativity is often treated as a secondary or indirect benefit.

This conceptual review has analyzed the works published between the years 2010 and 2025, taking into account the seminal theories of learning and creativity, CLIL pedagogical frameworks, and studies that explore their intersections. The above conceptual review conducted can be categorized into three main thematic strands: (1) conceptualizations of creativity in CLIL settings, (2) fostering creativity in CLIL, and (3) assessment of creativity in CLIL.

Author(s)	Year	Title	Type	Publisher / Journal
ACARA	2010	The shape of the Australian curriculum: The arts	Report	ACARA
Bachman & Palmer	2010	Language assessment in practice	Book	Oxford University Press
Ball, Kelly & Clegg	2015	Putting CLIL into practice	Book	Oxford University Press
Banegas	2014	Integrating content and language...	Journal Article	Studies in Second Language Learning and Teaching
Banegas	2021	Content and language integrated learning in Latin America	Book	Routledge
Beghetto	2013	Nurturing creativity in the classroom	Book	Cambridge University Press

Beghetto & Kaufman	2014	Classroom contexts for creativity	Journal Article	High Ability Studies
Cenoz, Genesee & Gorter	2014	Critical analysis of CLIL	Journal Article	Applied Linguistics
Chu et al.	2017	21st-century skills development through inquiry-based learning	Book	Springer
Coyle, Hood & Marsh	2010	CLIL: Content and language integrated learning	Book	Cambridge University Press
Cross	2012	Creative pedagogies and the contemporary CLIL classroom	Journal Article	International Journal of Bilingual Education and Bilingualism
Czura	2017	Higher-order thinking skills in CLIL classrooms	Journal Article	Theory and Practice of Second Language Acquisition
Dalton-Puffer	2011	Content-and-language integrated learning...	Journal Article	Annual Review of Applied Linguistics
Dooly	2012	Promoting critical thinking and creativity in CLIL classrooms	Journal Article	CLIL Journal of Innovation in Language Teaching and Learning
Dooly	2018	Telecollaboration and sustainability...	Book	Peter Lang
Fanchini, Jongbloed & Dirani	2019	Creativity and academic performance: A systematic review	Journal Article	Thinking Skills and Creativity
Gajda, Karwowski & Beghetto	2017	Creativity and academic achievement: A meta-analysis	Journal Article	Journal of Educational Psychology
González	2011	Higher order thinking skills in CLIL and non-CLIL settings	Journal Article	Revista Española de Lingüística Aplicada
Hansenne & Legrand	2012	Creativity, emotional intelligence, and school performance	Journal Article	Psychology of Aesthetics, Creativity, and the Arts
Huang et al.	2019	Domain knowledge and creative performance	Journal Article	Educational Psychology
Kozbelt, Beghetto & Runco	2010	Theories of creativity	Book Chapter	Cambridge University Press

Leikin	2012	The effect of bilingualism on creativity	Journal Article	International Journal of Bilingualism
Long, Lucas, Hanson & Beghetto	2022	Assessment of creativity in K-12 education	Journal Article	Thinking Skills and Creativity
Maley	2017	Creativity and English language teaching	Book	Palgrave Macmillan
Meyer	2010	Towards quality-CLIL	Article	PASE Papers in Language Studies
Otto & Estrada	2019	Assessment in CLIL	Journal Article	International Journal of Bilingual Education and Bilingualism
Pang	2015	Promoting creativity in the classroom	Article	Journal of Chinese Education Research and Development
Robinson	2011	Out of our minds	Book	Capstone
Romeu Peyró, Lorenzo & Dalton-Puffer	2020	Cognitive demands in CLIL materials	Journal Article	International Journal of Bilingual Education and Bilingualism
Runco, Acar & Cayirdag	2017	Creativity in and outside school	Journal Article	Thinking Skills and Creativity
Said-Metwaly, Fernández-Castro & Barbot	2017	Measuring creativity	Journal Article	Frontiers in Psychology
Sawyer	2012	Explaining creativity	Book	Oxford University Press
Smith & Smith	2010	Educational creativity	Book Chapter	Cambridge University Press
Sternberg	2010	Teaching for creativity in the common core classroom	Book	Corwin Press
Sternberg	2016	The nature of creativity and its development in education	Journal Article	Creativity Research Journal
Um, Plass, Hayward & Homer	2012	Emotional design in multimedia learning	Journal Article	Journal of Educational Psychology

Table 1. *The list of analyzed works between the years 2010-2025*

3.1 Conceptualizations of Creativity in CLIL

The reviewed literature indicated that creativity, though often valued, remains underrepresented as a central focus in CLIL research. CLIL frameworks such as the 4Cs model (Coyle, 1999; Meyer, 2010) and Bloom’s revised taxonomy (Anderson & Krathwohl, 2001) are widely cited as supporting higher-order thinking skills (HOTS), which include creativity. However, empirical studies reveal that many CLIL classrooms still prioritize lower-order thinking skills (LOTS), emphasizing factual recall and comprehension over analysis, evaluation, and creation (Romeu Peyró et al., 2020; Czura, 2017; Banegas, 2014). Thus, it could be understood that creativity is recognized as valuable within CLIL, yet not much operationalized in curriculum design or research frameworks.

3.2 Pedagogical Practices that Support Creativity

There is a consistent emphasis on the role of student-autonomy, open-ended tasks, and collaborative exploration as essential to nurturing creative engagement (Beghetto, 2013; Sawyer, 2012; Sternberg, 2010; Dooly, 2018). Generative learning activities such as reading, writing, debating, or composing (Pang, 2015) may also be effective as they require students to integrate language and content meaningfully. Several barriers to classroom creativity are also acknowledged such as unsupportive school climates (Hennessey, 2004), and teachers’ misconceptions about creative learners (Plucker, Beghetto, & Dow, 2004). It is widely agreed that creativity is a skill that can be learned through deliberate practice (Sternberg, 2016; Cross, 2012; Beghetto, 2013). Creativity in CLIL thus emerges as a multifaceted process— involving cognitive challenge (Coyle et al., 2010), metacognition (Dooly, 2018), and emotional engagement (Um, Plass, Hayward, & Homer, 2012).

3.3 Assessment of Creativity in CLIL

A consistent theme found across the research on CLIL and creativity is the lack of available assessment tools and the scarcity of research on creativity assessment in CLIL. However, creativity has been explored in general education and psychology through instruments such as the Torrance Test of Creative Thinking (TTCT) (Torrance, 1966, 2008). Some studies discuss assessment directly (e.g., Otto & Estrada, 2019; Coyle et al., 2010) and they primarily focus on evaluating content knowledge or language performance rather than specifically focusing on creative thinking. Thus, the review identifies this as a gap in CLIL research which is yet to

be further discovered.

4. Conclusions

This conceptual review aimed to highlight the relationship between CLIL and creativity. Through the analysis of the mentioned works, it is evident that CLIL offers a unique environment for fostering both language proficiency and higher-order thinking skills. The integration of 4Cs framework as well as cognitive models such as Bloom's Taxonomy, provides a structure and flexibility in which learners can develop critical and creative competencies.

Creativity does not emerge out of nothing, it is a skill that is learnable that benefits from intentional pedagogical design, scaffolding, and supportive classroom environment. CLIL classrooms inherently create this space for students by combining content knowledge with language use. Moreover, personalization, emotional engagement, and metacognitive awareness play significant roles in enabling learners to express originality meaningfully, while the incorporation of HOTS tasks ensures cognitive challenge and promotes imaginative problem-solving.

The review also underscores certain challenges within CLIL and creativity. These challenges particularly highlight the lack of materials, specific assessment tools to help teachers, and other risks of under-developing certain skills, especially higher-order thinking skills. These gaps highlight the need for careful curriculum design, teacher training and assessment practices. With this in mind, when creativity is seen as an intentional goal within CLIL pedagogy, it can enhance learner engagement, support cognitive and linguistic growth, and equip students with necessary skills to navigate real-world challenges.

5. References

- Anderson, L. W., & Krathwohl, D. R. (Eds.). (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*. Longman.
- Australian Curriculum, Assessment and Reporting Authority (ACARA). (2010). *The shape of the Australian curriculum: The arts*. ACARA.
- Bachman, L. F., & Palmer, A. S. (2010). *Language assessment in practice: Developing language assessments and justifying their use in the real world*. Oxford University Press.
- Ball, P., Kelly, K., & Clegg, J. (2015). *Putting CLIL into practice*. Oxford University Press.

Banegas, D. L. (2014). Integrating content and language in English language teaching in secondary education: Models, benefits, and challenges. *Studies in Second Language Learning and Teaching*, 4(2), 295–311. <https://doi.org/10.14746/ssllt.2014.4.2.8>

Banegas, D. L. (2021). *Content and language integrated learning in Latin America: Evidence and experiences*. Routledge.

Beghetto, R. A. (2013). *Nurturing creativity in the classroom*. Cambridge University Press.

Beghetto, R. A., & Kaufman, J. C. (2014). Classroom contexts for creativity. *High Ability Studies*, 25(1), 53–69. <https://doi.org/10.1080/13598139.2014.905247>

Bialystok, E. (2005). *Bilingualism in development: Language, literacy, and cognition*. Cambridge University Press.

Bloom, B. S. (Ed.). (1956). *Taxonomy of educational objectives: The classification of educational goals. Handbook I: Cognitive domain*. Longmans, Green.

Boden, M. A. (2004). *The creative mind: Myths and mechanisms* (2nd ed.). Routledge.

Carter, R. (2004). *Language and creativity: The art of common talk*. Routledge.

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>

Chu, S. K. W., Reynolds, R. B., Tavares, N. J., Notari, M., & Lee, C. W. Y. (2017). *21st-century skills development through inquiry-based learning: From theory to practice*. Springer.

Coyle, D. (1999). Supporting students in content and language integrated learning contexts: Planning for effective classrooms. In J. Masih (Ed.), *Learning through a foreign language: Models, methods and outcomes* (pp. 46–62). CILT.

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

Craft, A. (2005). *Creativity in schools: Tensions and dilemmas*. Routledge.

Cross, R. (2012). Creative pedagogies and the contemporary CLIL classroom. *International Journal of Bilingual Education and Bilingualism*, 15(4), 431–448. <https://doi.org/10.1080/13670050.2012.661776>

Czura, A. (2017). Higher-order thinking skills in CLIL classrooms: An analysis of tasks in CLIL textbooks. *Theory and Practice of Second Language Acquisition*, 3(2), 47–62.

Dalton-Puffer, C. (2007). *Discourse in content and language integrated learning (CLIL)*

classrooms. John Benjamins.

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>

Dooly, M. (2012). Promoting critical thinking and creativity in CLIL classrooms. *CLIL Journal of Innovation in Language Teaching and Learning*, 1(1), 1–8.

Dooly, M. (2018). *Telecollaboration and sustainability for foreign language learning*. Peter Lang.

Eisner, E. W. (2003). *The arts and the creation of mind*. Yale University Press.

Fanchini, G., Jongbloed, J., & Dirani, K. M. (2019). Creativity and academic performance: A systematic review. *Thinking Skills and Creativity*, 31, 64–75. <https://doi.org/10.1016/j.tsc.2018.11.003>

Fredrickson, B. L. (2001). The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions. *American Psychologist*, 56(3), 218–226. <https://doi.org/10.1037/0003-066X.56.3.218>

Freund, P. A., & Holling, H. (2008). Creativity in the classroom: Correlates and predictors. *Learning and Individual Differences*, 18(1), 12–21. <https://doi.org/10.1016/j.lindif.2007.08.004>

Gajda, A., Karwowski, M., & Beghetto, R. A. (2017). Creativity and academic achievement: A meta-analysis. *Journal of Educational Psychology*, 109(2), 269–299. <https://doi.org/10.1037/edu0000133>

González, M. J. (2011). Higher order thinking skills in CLIL and non-CLIL settings: A comparative study. *Revista Española de Lingüística Aplicada*, 24(1), 47–70.

Guilford, J. P. (1950). Creativity. *American Psychologist*, 5(9), 444–454. <https://doi.org/10.1037/h0063487>

Hafner, C. A., Chik, A., & Jones, R. H. (2017). *Digital literacies and language learning*. Routledge.

Hansenne, M., & Legrand, J. (2012). Creativity, emotional intelligence, and school performance in children. *Psychology of Aesthetics, Creativity, and the Arts*, 6(1), 48–54. <https://doi.org/10.1037/a0024828>

Hennessey, B. A. (2004). *Developing creativity in gifted children: The central importance of motivation and classroom climate*. National Association for Gifted Children.

Huang, P.-S., Peng, S.-L., Chen, H.-C., Tseng, L.-C., & Hsu, L.-C. (2019). The relative influences

of domain knowledge and creative potential on students' creative performance. *Educational Psychology*, 39(1), 1–16. <https://doi.org/10.1080/01443410.2018.1457774>

Immordino-Yang, M. H., & Damasio, A. (2007). We feel, therefore we learn: The relevance of affective and social neuroscience to education. *Mind, Brain, and Education*, 1(1), 3–10. <https://doi.org/10.1111/j.1751-228X.2007.00004.x>

Kaufman, J. C. (2016). *Creativity 101* (2nd ed.). Springer.

Kozbelt, A., Beghetto, R. A., & Runco, M. A. (2010). Theories of creativity. In J. C. Kaufman & R. J. Sternberg (Eds.), *The Cambridge handbook of creativity* (pp. 20–47). Cambridge University Press.

Leikin, M. (2012). The effect of bilingualism on creativity: Developmental and educational perspectives. *International Journal of Bilingualism*, 17(4), 431–447. <https://doi.org/10.1177/1367006912438300>

Long, H., Lucas, B., Hanson, J., & Beghetto, R. A. (2022). Assessment of creativity in K–12 education contexts: A literature review. *Thinking Skills and Creativity*, 44, 101024. <https://doi.org/10.1016/j.tsc.2022.101024>

Maley, A. (2017). *Creativity and English language teaching: From inspiration to implementation*. Palgrave Macmillan.

Marsh, D. (2002). *CLIL/EMILE—The European dimension: Actions, trends and foresight potential*. European Commission.

Meyer, O. (2010). Towards quality-CLIL: Successful planning and teaching strategies. *PASE Papers in Language Studies*, 1, 11–29.

Otto, A., & Estrada, J. L. (2019). Assessment in CLIL: Examining teachers' practices and beliefs. *International Journal of Bilingual Education and Bilingualism*, 22(1), 83–95. <https://doi.org/10.1080/13670050.2016.1244668>

Pang, W. (2015). Promoting creativity in the classroom: A general framework and teaching tips. *The Journal of Chinese Education Research and Development*, 5(3), 1–12.

Phelps, E. A. (2004). Human emotion and memory: Interactions of the amygdala and hippocampal complex. *Current Opinion in Neurobiology*, 14(2), 198–202. <https://doi.org/10.1016/j.conb.2004.03.015>

Plucker, J. A., Beghetto, R. A., & Dow, G. T. (2004). Why isn't creativity more important to educational psychologists? Potentials, pitfalls, and future directions in creativity research.

Educational Psychologist, 39(2), 83–96. https://doi.org/10.1207/s15326985ep3902_1

Robinson, K. (2011). *Out of our minds: Learning to be creative* (2nd ed.). Capstone.

Romeu Peyró, M., Lorenzo, F., & Dalton-Puffer, C. (2020). Cognitive demands in CLIL materials: A focus on higher-order thinking skills. *International Journal of Bilingual Education and Bilingualism*, 23(5), 613–629. <https://doi.org/10.1080/13670050.2018.1517722>

Renzulli, J. S. (2002). Emerging conceptions of giftedness: Building a bridge to the new century. *Exceptionality*, 10(2), 67–75. https://doi.org/10.1207/S15327035EX1002_2

Runco, M. A., Acar, S., & Cayirdag, N. (2017). A closer look at creativity in and outside school: Exploring creative self-efficacy and creative ideation. *Thinking Skills and Creativity*, 24, 234–242. <https://doi.org/10.1016/j.tsc.2017.04.003>

Said-Metwaly, S., Fernández-Castro, J., & Barbot, B. (2017). Measuring creativity: What's old, what's new, and what's next? *Frontiers in Psychology*, 9, 2411. <https://doi.org/10.3389/fpsyg.2017.02411>

Sawyer, R. K. (2012). *Explaining creativity: The science of human innovation* (2nd ed.). Oxford University Press.

Scoot, G., Leritz, L. E., & Mumford, M. D. (2004). The effectiveness of creativity training: A quantitative review. *Creativity Research Journal*, 16(4), 361–388. https://doi.org/10.1207/s15326934crj1604_1

Smith, J. K., & Smith, L. F. (2010). Educational creativity. In J. C. Kaufman & R. J. Sternberg (Eds.), *The Cambridge handbook of creativity* (pp. 250–264). Cambridge University Press.

Sternberg, R. J. (2002). *Creativity and intelligence: A tale of two concepts*. Cambridge University Press.

Sternberg, R. J. (2010). *Teaching for creativity in the common core classroom*. Corwin Press.

Sternberg, R. J. (2016). The nature of creativity and its development in education. *Creativity Research Journal*, 28(4), 355–360. <https://doi.org/10.1080/10400419.2016.1229249>

Torrance, E. P. (1966). *Torrance tests of creative thinking*. Scholastic Testing Service.

Torrance, E. P. (2008). *Torrance tests of creative thinking: Streamlined scoring guide*. Scholastic Testing Service.

Um, E. R., Plass, J. L., Hayward, E. O., & Homer, B. D. (2012). Emotional design in multimedia learning. *Journal of Educational Psychology*, 104(2), 485–498.

<https://doi.org/10.1037/a0026609>

Vollmer, H. J. (2008). *Assessing the language of school-age learners: Theoretical and practical aspects of language testing in CLIL contexts*. Council of Europe.

Wolfe, P. (2006). *Brain matters: Translating research into classroom practice* (2nd ed.). ASCD.

METHODS SHOWCASE ARTICLE

Integrating Neuroscience into CLIL for Early Primary Learners: Stimulating the Corpus Callosum to Support Learning

 **Simona Noli**
RESUMEN (Spanish)

Los recientes avances en neurociencia están ofreciendo nuevas formas de comprender cómo los niños aprenden idiomas y cómo la enseñanza puede ser más inclusiva en los contextos de aprendizaje integrado de contenidos y lenguas extranjeras (AICLE). A medida que la educación bilingüe se expande por Europa, cada vez es más esencial abordar las diversas necesidades de los alumnos neurodivergentes. Las investigaciones sobre el desarrollo del cerebro muestran que la neuroplasticidad, las funciones ejecutivas (FE) y la comunicación interhemisférica, en particular a través del cuerpo calloso (CC), desempeñan un papel fundamental en el desarrollo de la atención, la autorregulación y el lenguaje durante la primera infancia. Cuando estos procesos se desarrollan de forma atípica, como en el trastorno por déficit de atención e hiperactividad (TDAH) y el trastorno del espectro autista (TEA), los niños pueden encontrar dificultades adicionales en la comunicación y la participación. La incorporación de experiencias rítmicas, basadas en el movimiento y multisensoriales en las aulas bilingües puede mejorar la disposición para aprender y promover la participación de todos los alumnos. Basándose en estas ideas, el Programa de Integración Bilateral diseñado en este trabajo ofrece una secuencia de un año de duración de breves ejercicios diarios de calentamiento cruzado que estimulan la coordinación interhemisférica y fortalecen las FE. Arraigado en la neurociencia y alineado con los marcos educativos europeos y españoles, el programa ofrece un modelo práctico e inclusivo para apoyar el aprendizaje, la atención y el bienestar en la educación bilingüe temprana.

PALABRAS CLAVE

Neuroplasticidad;
Funciones ejecutivas (FE);
Comunicación interhemisférica;
Estudiantes neurodivergentes;
Programa de Integración Bilateral.

ABSTRACT (English)

Recent advances in neuroscience are offering new ways to understand how children learn languages and how teaching can become more inclusive within Content and Language Integrated Learning (CLIL) contexts. As bilingual education expands across Europe, addressing the diverse needs of neurodivergent learners has become increasingly essential. Research on brain development shows that neuroplasticity, executive functions (EFs), and interhemispheric communication, particularly through the corpus callosum (CC), play a central role in the growth of attention, self-regulation, and language during early childhood. When these processes develop atypically, as in attention-deficit/hyperactivity disorder (ADHD) and autism spectrum disorder (ASD), children may encounter additional challenges in communication and participation. Embedding rhythmic, movement-based, and multisensory experiences into bilingual classrooms can enhance readiness to learn and promote engagement for all pupils. Building on these insights, the Bilateral Integration Programme designed in this work provides a year-long sequence of short, daily cross-lateral warm-ups that stimulate interhemispheric coordination and strengthen EFs. Rooted in neuroscience and aligned with European and Spanish educational frameworks, the programme offers a practical, inclusive model for supporting learning, attention, and wellbeing in early bilingual education.

KEYWORDS

Neuroplasticity;
Executive functions (EFs);
Interhemispheric communication;
Neurodivergent learners;
Bilateral Integration Programme.

1. Neurobiological Foundation of Second Language Acquisition

Early childhood is a period of rapid brain growth and high neuroplasticity (Ferrè & Aribau, 2008). At this stage, language learning involves sensorimotor, cognitive, and social systems working together across both brain hemispheres. Understanding these neurobiological foundations helps educators design bilingual programmes suited to children's developmental and linguistic needs.

1.1. Brain Plasticity in Early Language Acquisition

Neuroplasticity is the brain's capacity to reorganise itself by forming, modifying, and strengthening neural connections in response to both internal experiences and external stimuli (Gazerani, 2025). In simple terms, it is the brain's ability to change through learning and experience. This capacity is especially pronounced in early childhood, when brain networks are highly sensitive and adaptable.

Studies in neuroscience using non-invasive imaging techniques, such as magnetoencephalography (MEG) and event-related potentials (ERP), have shown that language processing begins in infancy, long before speech emerges (Kuhl, 2010). As Sousa (2017) observed, "the brain of a newborn is not a tabula rasa, as was previously believed" (p. 33). Indeed, infants have the ability to distinguish phonetic contrasts from any language. Over time, this universal sensitivity narrows as the brain adapts to the sounds it hears most frequently, a process known as neural commitment (Kuhl, 2011). Through this experience-dependent plasticity, the brain determines which sounds to strengthen and which to weaken, a phenomenon commonly called in neuroscience "window of opportunity."

However, language learning does not happen in isolated brain "language areas." It involves broad neural networks integrating sensory, motor, and affective systems, whose coordination supports language acquisition (LA) (Friederici, 2011). Because brain plasticity is greatest in early childhood, this integration offers an opportunity to educators to design effective and inclusive educational interventions, particularly for neurodiverse learners. Experiences such as bilingualism can influence this process, promoting structural changes not only in language-specific cortical regions but also in broader networks of cognitive control (Pliatsikas, 2020). The Dynamic Restructuring Model (DRM) helps explain this process. It proposes that managing two or more languages strengthens grey- and white-matter connections and enhances the brain's flexibility and integration (Pliatsikas, 2020).

Around age five, most children can follow complex sentences, recognise familiar sound patterns, and keep their attention for up to fifteen minutes (Miguel, n.d.). This developmental phase coincides with rapid structural changes in the brain. Among these developments, myelination, the process of coating neural fibres with a fatty layer that speeds information transfer between brain regions, supports efficient inter-regional communication. This process facilitates the integration of phonological, semantic, and syntactic processing (Friederici, 2011; Kennedy, 2006). Bilingual experience can reinforce these connections, boosting language control as well as general cognitive flexibility (Costa, 2012).

Environmental input is also a key factor, Kuhl (2011) emphasises that early language mastery "requires learning in a social context" (p. 1). Similarly, Kennedy (2006) notes that meaningful, content-based language environments stimulate multiple sensory channels, increasing the relevance of linguistic input. Furthermore, activities that involve movement and multiple senses can further support learning by harnessing brain plasticity to support language and cognitive development (Shams & Seitz, 2008). Even though brain plasticity is particularly high in early childhood, it is still shaped by both biological maturation and experience (Kuhl, 2010; Kennedy, 2006). Consequently, it is vital to provide all children, especially those from

disadvantaged backgrounds or with neurodevelopmental conditions, with access to stimulating bilingual environments (Kuhl, 2011).

Neuroplasticity supports all learning. However, children with ADHD and ASD exhibit distinct neural pathways that shape both cognition and behaviour. In ASD, atypical brain maturation often results in either excessive or reduced connectivity between brain regions (Uddin et al., 2013). Similarly, children with ADHD show delayed white-matter development, particularly in attention networks and in the coordination between the brain's hemispheres (Shaw et al., 2015). These variations can affect phonological, grammatical, and pragmatic aspects of language acquisition (Uddin et al., 2013).

Yet, the high plasticity of young brains offers strong potential for bilingual learning. This flexibility can be channelled through well-designed programmes. Such initiatives support emotional, cognitive, and physical development.

1.2. Critical and Sensitive Periods of Language Acquisition

Neuroscientific research distinguishes between *critical* and *sensitive* periods of brain development. A critical period is a biologically predetermined window in which learning a specific skill can be acquired most effectively. Beyond this window, learning becomes restricted or, in some cases, impossible (Simply Psychology, 2023). By contrast, a sensitive period denotes a developmental stage optimal for learning, after which acquisition remains possible but less efficient. Contemporary language acquisition theory recognises that language development is affected by a sequence of overlapping sensitive periods, and the degree of plasticity differs among the diverse areas of language (Hensch, 2005; Thomas & Johnson, 2008; Werker & Hensch, 2015).

Early evidence for critical periods came from Konrad Lorenz's studies on filial imprinting (Thomas & Johnson, 2008). Since then, research has shown that some neural systems, particularly those involved in early sensory processing, display critical-period properties. In contrast, higher cognitive functions such as language develop through longer and more flexible sensitive phases (Thomas & Johnson, 2008).

Accordingly, sensitive periods arise as brain circuits adapt to environmental input, progressively refining and specialising. Thus, language-sensitive windows are fluid and overlapping rather than rigidly bounded. This flexibility reflects the brain's dynamic capacity for experience-dependent change (Hensch, 2005; Werker & Hensch, 2015).

In early language learning, sensitive periods appear differently across various areas of language. For instance, in phonological processing, newborns can distinguish all human speech sounds, but between six and twelve months this broad phonetic sensitivity narrows as the brain adapts to the sounds of the surrounding language(s) (Kuhl, 2010; Werker & Hensch, 2015). Kuhl (2010) demonstrated that this experience-driven tuning of neural circuits forms durable phonological categories that influence later literacy. Bilingual infants, however, display greater phonetic flexibility, as dual-language exposure can extend the sensitive period for sound discrimination (Kuhl, 2011; Werker & Hensch, 2015).

Besides phonology, grammatical development follows a distinct trajectory. Newport (1989) demonstrated that children learning a second language (L2) before age seven were far likelier to attain native-like grammatical competence, whereas late learners showed reduced syntactic ability. Similarly, Werker and Hensch (2015) confirmed that sensitivity to morphosyntax declines significantly past age seven, though explicit learning remains possible. By contrast, lexical acquisition continues throughout life, since vocabulary learning relies more on memory and conceptual association than on fixed neural timing (Thomas & Johnson, 2008).

Accordingly, the overlapping and extended nature of sensitive periods thus supports the rationale for early bilingual education. Although certain linguistic abilities are most effectively acquired early in life, the capacity for successful language learning remains open through the early primary years. This is particularly true when children engage in rich, socially interactive, and meaningful communicative contexts that nurture both cognition and emotion.

1.3. Neural Basis of L2 Acquisition

Classical models of neurolinguistics located language almost exclusively in the left hemisphere, particularly in Broca's and Wernicke's areas. Contemporary neuroscience, however, demonstrates that language emerges from distributed and interactive networks across both hemispheres. Friederici (2011) demonstrated, using evidence from functional magnetic resonance imaging (fMRI) and positron emission tomography (PET), that language processing is not confined to discrete cortical areas but arises from dynamic interactions among multiple brain systems.

The inferior frontal gyrus (IFG) and posterior superior temporal gyrus (STG) form an integrated frontotemporal network by interacting via the arcuate and superior longitudinal fasciculi. These findings challenge the notion of a localised "language organ" and support the view of language as a bilateral, networked function.

From birth, infants show distributed brain activity in response to speech, indicating that language processing begins long before the brain's hemispheres become specialised, a process known as lateralisation (Friederici, 2011). Auditory and motor cortices cooperate during speech perception and production, reflecting how closely hearing and speaking are linked (Pulvermüller & Fadiga, 2010). Motor regions are also engaged when processing action-related words. For instance, words such as *grasp* or *kick* activate the corresponding motor areas in the hand or leg, evidencing the embodied nature of semantic representation (Pulvermüller, 2013).

In addition, emotional aspects of speech, such as prosody, activate limbic and paralimbic structures like the amygdala, anterior cingulate cortex, and orbitofrontal areas, which support attention and affective interpretation (Schirmer & Kotz, 2006).

Language learning in early childhood is thus embodied, social, and multimodal. Kuhl (2011) demonstrated that socially engaging experiences foster "neural commitment" to linguistic representations, enhancing learning. This evidence aligns with Pulvermüller's

(2013) embodied cognition theory, in which auditory, motor, and affective systems interact to build meaning.

As these systems mature, the organisation of the language network also changes. By ages five to six, the main language areas of the brain are already in place, although the connections between them are still developing (Friederici, 2011). At this stage, children use both sides of the brain for language, while adults rely more on the left side. The pathway that links regions for grammar and sentence structure continues to mature throughout childhood. In contrast, the network that supports understanding word meanings is already well developed from infancy.

At this stage of development, the brain continues to refine its internal connections through two key processes. Synaptic pruning, which removes weaker or unused connections between neurons, and myelination, which coats active nerve fibres with a fatty layer that speeds communication between regions, strengthen the brain's efficiency (Friederici, 2011). Together, these processes support vocabulary growth and the gradual mastery of grammar.

Children with neurodevelopmental conditions often show different patterns of brain connectivity. In ASD, communication between the two hemispheres may be reduced, affecting rhythm, meaning, and sentence structure (Kana et al., 2014). In ADHD, differences in the brain areas that support attention, planning, and language control can make it harder to manage complex grammar or switch between languages (Vaidya & Stollstorff, 2008). These variations highlight the importance of multisensory and movement-based teaching methods that engage several brain systems and can enhance bilingual learning for all children.

Bilingual experience enhances interhemispheric communication and cognitive flexibility. In this regard, Petitto et al. (2012) used functional near-infrared spectroscopy (fNIRS) to show that bilingual children activate similar neural mechanisms for both languages but demonstrate stronger cross-hemispheric connectivity than monolinguals. Such distributed processing supports attentional control and adaptive learning (Petitto et al., 2012).

These findings support multisensory and emotionally engaging approaches in early L2 teaching. Activities such as movement, songs, and role-play have been shown to enhance word learning in children (Macedonia, 2019). For neurodivergent learners, these approaches also improve attention and interhemispheric coordination. Since five- and six-year-olds are still developing syntactic skills, bilingual instruction should prioritise interactive experiences over formal grammar. Sensitive periods for language in ADHD and ASD may differ. In ASD they often involve delayed phonological or pragmatic growth (Eigsti et al., 2011; Kuhl, 2010), while in ADHD they are characterised by attention-related difficulties (Korrel et al., 2017). Therefore, flexible and inclusive bilingual programmes are essential to meet diverse developmental needs.

2. The Role of the Corpus Callosum in Language Acquisition

Early language acquisition depends on coordinated activity between the brain's hemispheres, mediated by the corpus callosum (CC). In five and six-year-olds, this interhemispheric integration supports the motor, sensory, and cognitive functions fundamental in bilingual learning. Understanding CC functioning can thus inform the design of bilingual programmes that promote whole-brain language processing.

2.1. *Corpus Callosum Development in Early Childhood and Bilingualism*

The CC is the largest white-matter structure in the brain, containing over 300 million myelinated nerve fibres, axons, which interconnect the two hemispheres (Hofer & Frahm, 2006). It acts as a communication bridge, enabling the exchange of information between both sides of the brain and supporting sensory, motor, and cognitive functions. Anatomically, it lies within the medial longitudinal fissure and is divided into the rostrum, genu, body, and splenium, which connect distinct cortical regions from the prefrontal to the occipital lobes (Mathias, 2023).

Most of its fibres link matching areas in the two hemispheres, homotopic connections, while others link different areas, heterotopic connections. Large diameter axons transmit sensorimotor information rapidly, whereas smaller ones connect regions engaged in complex processes such as language and executive control (Aboitiz et al., 1992).

The CC begins forming around the tenth week of gestation and its maturation, particularly the progressive myelination of callosal fibres, continues into adolescence (Bloom & Hynd, 2005). Around ages five to six, interhemispheric communication becomes faster and more efficient, coinciding with advances in phonological development, motor coordination, and hemispheric lateralisation. For example, during this period, children's ability to break words into individual sounds, a skill known as phonemic segmentation, increases from roughly 17% to 70% accuracy (Miguel, n.d.).

At this stage, children show rapid growth in interhemispheric connectivity, linguistic proficiency, and metalinguistic awareness (Friederici, 2011). They begin transferring information across sensory modalities, distinguishing subtle phonetic contrasts, and maintaining longer attention spans. These skills rely on precise interhemispheric communication which is facilitated by the CC. For instance, the regions in the left hemisphere process phonemic detail, while the right regions analyse prosody and timing information (Friederici, 2011; Schirmer & Kotz, 2006). Such bilateral interaction becomes critical as children learn to interpret pragmatic meaning, sarcasm, irony, or indirect requests, which require sensitivity to both literal content and social context (Paul, 2007).

Experience and the environment play a major role in shaping callosal organisation. Enriched linguistic and sensorimotor environments strengthen interhemispheric connectivity, whereas limited stimulation correlates with atypical maturation (Fields, 2008; Mackey et al., 2012). This shows that white-matter development is experience-dependent, adapting to learning and environmental demands (Fields, 2010; Lebel & Deoni, 2018).

One of the most cognitively intensive experiences influencing CC structure is bilingualism. Managing two languages requires constant coordination between lexical, grammatical, and pragmatic systems, which imposes higher interhemispheric demands (Mohades et al., 2012). Brain imaging shows that bilinguals engage broader, more bilateral networks than monolinguals, with the CC mediating processes such as code-switching, cross-linguistic transfer, and metalinguistic control (Luk et al., 2011).

Bilingual learners juggle two phonological systems, grammar rules, and vocabularies while adjusting language use to social context. Therefore, an effective interaction between the two hemispheres is essential. The left hemisphere supports linguistic form, while the right contributes to affective tone and communicative intent. This interplay enhances metalinguistic sensitivity and executive control, the mental skills that help learners shift focus, inhibit interference, and switch between languages (Costa, 2012).

The ages five to six constitute a sensitive window when increased myelination and plasticity facilitate L2 consolidation (Costa, 2012; Miguel, n.d.). During this period, children begin to choose which language to use depending on the situation and their listener. This behaviour relies on connections between the prefrontal cortex and the CC, which support attention shifting and inhibition. In turn, the CC continues reorganising in response to bilingual experience, becoming increasingly specialised through use (Pliatsikas, 2020).

Brain imaging confirms that early bilingual exposure changes both the structure and function of the CC. Coggins et al. (2004) found clear anatomical differences between bilingual and monolingual adults. They concluded that “the corpus callosum undergoes adaptation to accommodate multiple language facility” (p. 72). These adaptations likely involve greater myelination and fibre density, which improve coordination and reduce interference between languages.

Similarly, Negin et al. (2016) observed larger callosal volume in simultaneous bilinguals, especially in the anterior and midbody regions. These areas are crucial for managing interference and supporting executive control. Together, these findings support Mohades et al.’s (2012) conclusion that bilingualism brings about early structural changes in the CC.

Building on this, diffusion-tensor imaging (DTI) studies offer further insight into these adaptations at a finer scale. Mohades et al. (2012) found that simultaneous bilingual children had more complex fibre organisation in the front part of the CC than monolinguals, suggesting richer interhemispheric connections. In contrast, sequential bilinguals, who learn their second language later, showed intermediate patterns. This finding suggests that bilingual experience gradually reshapes the brain.

Comparative analyses further reveal that bilingualism enhances white-matter integrity of the front regions of the CC, associated with attention control, inhibition, and cognitive flexibility (Luk et al., 2011; Pliatsikas, 2020). For example, bilingual children often demonstrate better attention span and an improved ability to switch between tasks, thanks to stronger connectivity in these brain regions. These EFs help bilingual learners alternate between languages and reduce interference (Mohades et al., 2012). Stronger anterior connectivity implies better integration of syntactic, lexical, and phonological information across hemispheres (Van der Knaap & Van der Ham, 2011). In contrast, monolingual children,

who operate a single language system, show less interhemispheric engagement and reduced white-matter specialisation (Pliatsikas, 2020). The cumulative evidence therefore portrays the CC as a dynamic, experience-dependent structure that reorganises in response to bilingual demands.

Beyond white-matter connectivity, research links bilingualism to cortical surface area differences, especially in the praecuneus, indicating long-term structural adaptation to managing two languages (Pliatsikas et al., 2020).

2.2. Corpus Callosum Development in Children with ADHD and ASD

Neurodevelopmental conditions such as ADHD and ASD share atypical patterns of CC development, which can significantly affect language and other cognitive functions (Ferre & Aribau, 2008). The most consistent findings across both profiles include altered growth trajectories, microstructural abnormalities, and disrupted interhemispheric connectivity. These differences can weaken EFs, phonological awareness, pragmatic language, and motor-sensory coordination (Travers et al., 2015; Zhang et al., 2023).

For bilingual learners with ADHD or ASD, these atypical neural patterns pose particular challenges, as successful bilingual acquisition depends on flexible interhemispheric connectivity to manage two linguistic systems across social and communicative contexts (Costa, 2012; Pliatsikas, 2020). Understanding CC development in these groups is therefore essential to guide inclusive bilingual pedagogy.

In the case of ADHD, structural anomalies in the CC are frequently observed, though their exact location varies. Seidman et al. (2005) found consistent reductions in the splenium, the rear section of the CC that connects visual and sensory regions, while changes in the front areas were less consistent. Connaughton et al. (2022) also reported irregularities in both the front and back white-matter fibres. Overall, ADHD involves atypical CC development affecting interhemispheric connections. This affects attention, working memory, and executive control, all key processes in bilingual management.

In ASD, CC alterations are typically marked by reduced volume across the genu, body, and splenium (Travers et al., 2015). Courchesne et al. (2007) linked these differences to early brain overgrowth followed by irregular white-matter development. Brain imaging studies show that younger autistic children may initially display unusually high connectivity between brain regions, suggesting temporary overcommunication. As development progresses, this connectivity often declines, reflecting weaker long-range communication pathways (Travers et al., 2015). These irregularities disrupt the integration of social and linguistic information, making it harder to interpret tone, context, and meaning in conversation (Kana et al., 2014). At the same time, CC development in ASD varies widely among individuals. Nordahl et al. (2015) found sex-related structural differences, while Zhang et al. (2022) reported that callosal volume changes with cognitive ability and other developmental factors. Together, these findings highlight that autism encompasses diverse patterns of brain organisation rather than a single structural profile.

Despite distinct neural profiles, ADHD and ASD share overlapping disruptions in interhemispheric pathways. Posterior callosal anomalies are more typical in ADHD, whereas broader reductions occur in ASD. Children with co-occurring ADHD-ASD profiles often exhibit pronounced language control and EFs deficits (Connaughton et al., 2022; Travers et al., 2015; Uddin et al., 2013).

In ADHD disrupted CC organisation may impair attentional control and language switching, increasing interference from non-target languages (Wu et al., 2025). Similarly, in ASD reduced CC integrity affects grammatical, prosodic, and pragmatic processing (Kana et al., 2014). Both conditions therefore make managing two languages more challenging, particularly in multilingual learning environments.

Motor-sensory integration, fundamental to many bilingual pedagogies involving movement and rhythm, can also be affected. Children with ASD or ADHD frequently present motor-coordination difficulties linked to CC anomalies (Demopoulos et al., 2017; Mostofsky et al., 2009). These may impair articulation, phonological processing, and synchronisation of speech with movement-based learning, elements central to early bilingual education (Travers et al., 2015).

Since the CC remains malleable throughout childhood, bilingual exposure may enhance interhemispheric connectivity and promote adaptive neural reorganisation (Pliatsikas, 2020; Uddin et al., 2013). Longitudinal L2 studies show that interhemispheric coordination evolves with proficiency, with reduced left-hemispheric inhibition and increased right-hemisphere engagement at advanced stages (Wei et al., 2024), demonstrating experience-dependent CC plasticity. Thus, multisensory and movement-based bilingual learning may offer alternative neural pathways that support language development in children with ADHD and ASD (Costa, 2012; Mostofsky et al., 2009; Pliatsikas, 2020).

Integrating cross-lateral movement into bilingual classrooms can improve engagement and cognitive coordination, both vital for L2 learning, especially in neurodivergent children. Because the brain regions for language are most receptive in early childhood—narrowing after about age five and again around ten to twelve—early multisensory exposure is crucial. Johnson and Newport (1991) found that children who learned English between ages three and seven achieved near-native proficiency, while later learners showed lower attainment. Early, movement-based bilingual activities therefore strengthen neural connectivity and language processing during the brain's most plastic stage (Thomas & Johnson, 2008).

3. Neurodevelopmental Disorders and L2 Acquisition

ADHD and ASD, usually diagnosed in early childhood (American Psychiatric Association, 2013), involve cognitive and linguistic differences that influence bilingual learning (Thapar et al., 2017; Geurts & Embrechts, 2008). Inclusive pedagogies are essential to support language and cognitive development (Carballo & Portero, 2018; Miguel, n.d.).

3.1. ADHD and ASD in Early Childhood: Characteristics and Overlapping Traits

ADHD and ASD are neurodevelopmental disorders increasingly identified in early childhood. Specifically, ADHD often persists into adolescence and adulthood and is characterised by persistent patterns of inattention, hyperactivity, and impulsivity that affect academic, social, and emotional functioning (American Psychiatric Association, 2013; Thapar et al., 2013). The *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5) distinguishes three presentations:

- predominantly inattentive (difficulties with focus and organisation),
- predominantly hyperactive-impulsive (restlessness and impulsive behaviour),
- combined, which includes features of both (APA, 2013).

Similarly, ASD involves persistent difficulties in social communication and restricted or repetitive behaviours (APA, 2013). Symptoms emerge early in life and vary in severity, hence its description as a spectrum. Common traits include limited non-verbal communication, insistence on sameness, and unusual sensory responses. Neuroimaging shows atypical connectivity in regions involved in social, language, and sensory integration, including the amygdala, temporal lobes, and cerebellum (Di Martino et al., 2013; Giedd & Rapoport, 2010).

ADHD and ASD, once considered distinct under DSM-IV-TR criteria, are now recognised as potentially co-occurring in the DSM-5 (APA, 2013). Evidence indicates overlapping phenotypes with shared deficits in attention, social interaction, and EF (Craig et al., 2015). Even in early childhood, children may display features of both; autistic learners often show hyperactivity and inattention, while those with ADHD may exhibit social and pragmatic communication difficulties (Thapar et al., 2013).

Moreover, both conditions share difficulties in executive functioning, particularly in cognitive flexibility, working memory, planning, and inhibition, skills essential for learning and language development. Emotional regulation and sensory processing challenges are also common, often leading to impulsivity, behavioural issues, and reduced engagement in social learning (Geurts & Embrechts, 2008; Helland et al., 2010). These challenges typically emerge during early schooling, when structured tasks demand sustained attention and reasoning.

Atypical brain rhythms, particularly in the slower (theta) and faster (gamma) frequency ranges, can disrupt speech timing and sound processing, contributing to language difficulties in ADHD and ASD (Giraud & Poeppel, 2012). Interventions that use rhythm, rhyme, and melody, collectively referred to as *prosodic scaffolding*, can help the brain re-establish more synchronised timing patterns (Goswami & Leong, 2013). These overlapping symptoms likely arise from shared differences in brain networks that manage EF, attention and social understanding (Di Martino et al., 2013; Fair et al., 2012). Furthermore, abnormal interhemispheric communication may contribute to similar behavioural patterns, suggesting a developmental continuum shaped by genetics, maturation, and environment (Thapar et al., 2017; Uddin et al., 2017).

Neuroimaging shows that ADHD involves delayed prefrontal maturation affecting executive control, while ASD features atypical development in regions for social cognition, language,

and motor skills (Giedd & Rapoport, 2010; Lenroot & Giedd, 2006). Both also present white-matter irregularities in the CC, disrupting interhemispheric communication and hindering sensory, linguistic, and motor integration (Frazier & Hardan, 2009). For young bilingual learners, these deficits can complicate language and literacy development. Moreover, overlapping traits often blur diagnostic boundaries. Hyperactivity in autistic children or social withdrawal in ADHD may mask co-occurring features, delaying support and highlighting the need for nuanced, developmentally sensitive assessment (Francés et al., 2022).

Language profiles in ADHD and ASD are highly variable but show distinct patterns. Children with ADHD often struggle with narrative cohesion, expressive language, and pragmatics due to limited attention and working memory, leading to impulsive or disorganised speech (Geurts & Embrechts, 2008). In contrast, children with ASD typically face more persistent challenges, delayed speech onset, echolalia, reduced gesture use, and atypical prosody, despite adequate vocabulary and syntax, reflecting broader deficits in discourse and social-pragmatic communication (Eigsti et al., 2011; Helland et al., 2010; Norbury & Sparks, 2013).

The overlap between ADHD and ASD often complicates classroom practice, as strategies suited to one condition may overlook traits of the other. This comorbidity highlights the importance of early identification and specialised teacher training to recognise differences in attention, language, and motor coordination during peak neuroplasticity (Helland et al., 2010; Portellano & García, 2014; Francés et al., 2022).

Rich language experiences, such as shared reading and responsive dialogue, strengthen the brain networks that support language and EF, which often develop differently in these learners (Romeo et al., 2018; Lukito et al., 2020). Structured interventions like the *Nuffield Early Language Intervention (NELI)* show lasting gains in vocabulary, listening, and literacy, highlighting schools' role as supportive environments for children at developmental risk (Education Endowment Foundation & RAND Europe, 2020; Hulme et al., 2025).

3.2. Implications for Early Bilingual Education

Neurodevelopmental conditions like ADHD and ASD exhibit distinctive developmental trajectories with important implications for early bilingual education. During this period, around ages five and six, rapid advances in language, EF, and interhemispheric integration coincide with the onset of literacy, as children begin linking graphemes and phonemes across one or more languages (Lenroot & Giedd, 2006; Nkurunziza, 2024). In ADHD and ASD, these typical developmental processes interact with atypical neural patterns, influencing attention, sensory integration, and language coordination (Gazzaniga, 2005; Lenroot & Giedd, 2006).

As a consequence, children with ADHD and ASD often show delays or atypical patterns in phonology, syntax, and pragmatics due to EF deficits affecting attention, memory, and flexibility (Helland et al., 2012; Kuhl et al., 2005). ADHD learners struggle with sustained focus, while autistic children face social-pragmatic challenges, especially in dynamic L2 contexts. These difficulties directly shape participation in bilingual education (Craig et al., 2016; Norbury & Sparks, 2013).

Until recently, educational and clinical practice often discouraged bilingual exposure for neurodivergent children, fearing added cognitive strain (Digard et al., 2023; Howard et al., 2019). However, research indicates that bilingualism does not exacerbate language or attention difficulties in ASD or ADHD and can even improve cognitive flexibility and social interaction in autistic learners (Köder et al., 2022; Howard et al., 2021).

The focus has therefore shifted from questioning *whether* neurodivergent children can be bilingual to understanding *how* bilingual education can adapt to their developmental profiles, moving beyond monolingual, deficit-based models toward inclusive, neurodevelopmentally informed practice (Andreou & Skrimpa, 2022).

Neuroanatomically, bilingualism engages attentional control, inhibition, and working memory, areas often underdeveloped in ADHD and ASD (Andreou et al., 2020; Bialystok et al., 2012). Managing two linguistic systems promotes functional connectivity and white-matter plasticity, particularly in the CC (Felton et al., 2017), reinforcing normal interconnectivity and supporting metalinguistic awareness and phonological decoding, key components of early reading (Lenroot & Giedd, 2006; Mohades et al., 2012; Bialystok et al., 2012).

However, these benefits depend on pedagogical environments attuned to individual cognitive profiles. While CLIL is effective for many learners, equires managing several tasks at once and understanding abstract ideas, which can be challenging for those with ADHD or ASD (Segura, 2023; Sorge et al., 2017). Without differentiation, CLIL's contextualised input can impose excessive cognitive load on students (Le Cunff et al., 2024; Madrid & Pérez, 2018). Learners with weak working memory may struggle to process new content and unfamiliar L2 structures simultaneously (Holmes et al., 2014). In turn, ASD pupils may find implicit social-pragmatic cues in large, fast-paced groups especially demanding (Reindal et al., 2023).

The gap between inclusive policy and classroom practice in Spain has been underscored by initiatives such as the ADiBE project. Although national frameworks promote "*atención a la diversidad*," many bilingual programmes still lack flexibility in curriculum, teacher preparation, and assessment for neurodivergent learners (Casas & Rascón, 2023). Standardised tests based on monolingual, neurotypical norms often underrepresent neurodivergent children and lead to misguided interventions (Uljarević et al., 2016).

It is therefore essential to distinguish language-learning difficulties from neurodevelopmental traits. Speech impulsivity in ADHD may resemble poor L2 grammar, while echolalia in ASD can be mistaken for language delay (Geurts & Embrechts, 2008; Norbury & Sparks, 2013). Teacher training grounded in neurodevelopmental understanding can prevent such misinterpretations, especially in early bilingual settings (Yoro et al., 2020; Justus et al., 2025).

Neuroeducation research supports multisensory, embodied pedagogies that use movement, rhythm, and touch to enhance comprehension and memory in learners with atypical connectivity (Barsalou, 2008; Glenberg & Gallese, 2012). Bilateral and cross-lateral activities can strengthen interhemispheric coordination and support language learning in children with ADHD and ASD (Harris et al., 2018; Travers et al., 2015).

Inclusive bilingual education should adopt whole-brain, developmentally sensitive approaches that foster metalinguistic awareness, flexibility, and social communication (Pliatsikas, 2020; Carballo & Portero, 2018).

4. Innovation Proposal: Bilateral Integration Programme for Early Years Learners

4.1. Rationale and Design of the Programme

As previously discussed, neuroscience offers valuable insights into how learning processes can be optimised through evidence-based, developmentally informed teaching. These findings are particularly relevant within CLIL settings, as they illuminate the cognitive and linguistic demands placed on young bilingual learners. Building on this framework, the programme presented here has been designed to integrate short, daily bilateral warm-ups that strengthen EFs and promote classroom readiness in early primary education.

The proposal emerges from the intersection of neuroscience, bilingual education, and inclusive pedagogy, addressing the need for practical, classroom-based tools that enhance attention, self-regulation, and engagement. Although Spain's LOMLOE (Ley Orgánica 3/2020) promotes inclusive education, many schools still lack evidence-based tools to translate this principle into daily practice, particularly in early bilingual contexts. The programme therefore offers a practical, low-preparation tool to strengthen classroom participation and provide equitable access to learning across neurotypes.

At its core, the programme draws upon the role of the CC, the main interhemispheric bridge of the brain that integrates cognitive, linguistic, and motor processes (Van der Knaap & Van der Ham, 2011). The CC enables cooperation between the hemispheres in support of EFs, attention regulation, and working memory, all crucial for literacy, numeracy, and language learning (Diamond, 2013). Research shows that children with ADHD and ASD often present atypical development in this structure, which can interfere with self-regulation and language processing (Frazier & Hardan, 2009). Bilateral warm-ups, such as short routines involving coordinated cross-midline movements, offer a simple, evidence-based method to prepare the brain for focused, balanced learning (Dennison & Dennison, 1986; Jensen, 2005).

Brief daily sessions of 10–15 minutes, enhance attention, motivation, and emotional regulation by linking motor and cognitive systems (Jensen, 2025; Boyle, 2007). Designed to be inclusive and non-verbal, they particularly benefit neurodivergent pupils aged five to six, when EFs are especially malleable (Zelazo et al., 2016). Early intervention at this stage fosters lasting gains in academic and social readiness and prepares learners for CLIL contexts requiring dual cognitive and linguistic processing (Coyle et al., 2010).

While earlier initiatives such as Brain Gym (Dennison & Dennison, 1986) or Tools of the Mind (Bodrova & Leong, 2007) have explored the links between movement and cognition, none have explicitly embedded bilateral CC stimulation within bilingual or CLIL-based frameworks. The proposed programme fills this gap by providing a scaffolded sequence of warm-ups aligned with the inclusive and competence-based objectives of LOMLOE (2020) and the European Education Area 2025 (European Commission, 2020). These frameworks emphasise

multilingualism, equity, and the development of transversal competences essential for lifelong learning.

The innovation also supports the European Agency for Special Needs and Inclusive Education's (2019) call for universal learning strategies that benefit all children while offering additional scaffolding for those with specific needs. As CLIL methodology requires simultaneous processing of subject content and an additional language, it imposes high demands on attentional control, cognitive flexibility, and working memory (Coyle, 2007). For children with ADHD or ASD, such tasks may prove overwhelming unless adequate preparatory routines are provided (Casas & Rascón, 2023). Daily bilateral warm-ups serve as cognitive and emotional bridges, facilitating readiness for demanding bilingual tasks.

The programme runs across one full academic year and consists of 185 unique 15-minute sessions, each comprising three structured activities that stimulate interhemispheric communication. Four core components guide its design: bilateral coordination, rhythm, cross-lateral integration, and embodied cognition. Tasks evolve gradually from simple mirrored actions to complex, symbolic, and creative routines. Over time, children practise a range of tasks such as table tapping, mirror drawing, infinity tracing, clap-stomp rhythms, and partner mirroring games. The progression follows a ten-month scaffolded sequence in which early months emphasise coordination and rhythm, while later stages progress towards imaginative and collaborative exercises.

The sessions are intentionally non-verbal, allowing full participation regardless of linguistic ability or neurotype. Their structure is flexible, easily adapted to different class sizes, time constraints, and ability levels. Teachers act as facilitators, modelling movements, encouraging creativity, and supporting peer collaboration.

Beyond motor coordination, the activities nurture communication, teamwork, and emotional balance, which are transversal competences essential for success in bilingual education (OECD, 2019). Warm-ups are implemented before high-load subjects such as literacy, mathematics, or L2, helping children begin lessons with focus and calm. Evidence confirms that brief, structured movement enhances readiness and reduces behavioural disruptions (Diamond & Ling, 2020; Jensen, 1998).

4.2. Implementation, Competences, and Evaluation

In addition to its pedagogical rationale, the programme explicitly advances the core competencies defined in LOMLOE (2020) and the European Framework of Key Competences for Lifelong Learning (Council of the European Union, 2018). These encompass linguistic, cognitive, personal, and cultural dimensions developed through structured physical and reflective engagement. The programme not only supports literacy and language awareness but also contributes to digital, civic, and entrepreneurial competences by strengthening foundational abilities such as attention, sequencing, and collaborative problem-solving (Table 1).

LOMLOE Competence	EU Key Competence	Programme Contribution with Justification
CCL Competencia en comunicación lingüística	Literacy competence	Though non-verbal, daily warm-ups enhance auditory processing, sequencing, and symbolic representation. Activities such as mirror drawing and following oral instructions indirectly prepare children for reading and writing (Jensen, 2005).
CP Competencia plurilingüe	Multilingual competence	Embedding the routines into CLIL lessons supports metalinguistic awareness, as verbal classroom cues are paired with non-verbal tasks. This raises sensitivity to language use and code switching in bilingual settings (Coyle et al., 2010).
STEM Competencia matemática y competencia en ciencia, tecnología e ingeniería	Mathematical competence and competence in science, technology, and engineering	Bilateral routines strengthen sequencing, pattern recognition, and spatial reasoning, laying neural foundations for numeracy and early STEM learning (Harris et al., 2018).
CD Competencia digital (indirect)	Digital competence (indirect)	While not digital in themselves, warm-ups promote visual motor integration and sequencing, core to multimodal literacy. Teachers may model activities via ICT tools, linking with CLIL's digital dimension (Coyle et al., 2010)
CPSAA Competencia personal, social y de aprender a aprender	Personal, social and learning to learn competence	Structured routines foster self-regulation, working memory, and autonomy. Peer mirroring and reflection icons encourage empathy, collaboration, and metacognitive awareness. (Diamond & Ling, 2020).

CC Competencia ciudadana (indirect)	Citizenship competence (indirect)	Group synchrony, turn-taking, and shared routines promote school coexistence (convivencia escolar) and respect for rules, providing a foundation for civic responsibility (OECD, 2019)
CE Competencia emprendedora (indirect)	Entrepreneurship competence (indirect)	Creative tasks, such as inventing bilateral routines, foster initiative, imagination, and persistence, early entrepreneurial skills of turning ideas into action (OECD, 2019)
CCEC Competencia en conciencia y expresión culturales	Cultural awareness and expression competence	Rhythmic and symbolic tasks support embodied creativity, inclusivity, and cultural expression, allowing all children to explore identity through movement and art (OECD, 2019)

Table 1. Alignment of the programme with LOMLOE and EU key competences

Each session follows a three-part structure combining focus, rhythm, and creativity. The example below illustrates the design of the first session.

Sample session

Day 1 - Introduction to Bilateral Warm-Ups

Tasks:

1. **Both-Hand Table Taps (simultaneous):** Children sit at their desks. They place both hands flat on the table and tap them together at the same time in a steady rhythm, following the teacher's lead.

Purpose: To establish group synchrony, bilateral awareness, and rhythm.

2. **Finger Thumb Rings (index to pinky, both hands):** Children touch the tip of their thumb to each finger in turn (index, middle, ring, little), forming little "rings." Both hands move in synchrony.

Purpose: To develop fine motor control, sequencing, and attention.

3. **Mirror Drawing Straight Lines:** Each child holds a pencil in each hand. They draw vertical straight lines down a page, both hands moving together in mirror form.

Purpose: To introduce mirror symmetry and bilateral fine motor practice.

Materials: Paper, pencils, clay, and classroom space.

Benefits:

- It supports bilateral coordination and early cross-lateral awareness.
- It develops fine motor skills and focus.
- It establishes cooperative group rhythm from the first session.

Key Competences (LOMLOE):

- **CPSAA:** Bilateral awareness, sequencing, attention.
- **CMCT:** Fine motor control, pattern recognition.
- **CEC:** Body expression through drawing.

Evaluation is embedded within the programme's daily and monthly cycles of practice, in line with LOMLOE (2020) and Real Decreto 95/2022, which emphasise formative assessment and individualised observation. Assessment operates at three levels: student learning, self-evaluation, and overall effectiveness. Teachers complete brief monthly checklists on coordination, rhythm, attention, and motivation to monitor progress and identify areas needing support.

Children also engage in simple self-evaluation using a colour-based reflection to express how they felt about each session, fostering metacognitive awareness and emotional regulation (Education Endowment Foundation, 2025). Short peer and group reflections further reinforce communication and empathy.

At the end of the school year (Day 185), pupils collaborate to design and perform their own bilateral routine, demonstrating autonomy, creativity, and mastery. Teachers use a summative checklist to evaluate coordination, focus, and innovation, while a final review records feasibility, engagement, and observed impact on classroom climate.

In sum, the Bilateral Integration Programme offers a concrete, inclusive model for linking neuroscience with classroom practice. It is low-cost, adaptable, and grounded in universal principles of learning that benefit all children, particularly in bilingual and CLIL contexts where attention, regulation, and language interact. Through rhythm, movement, and embodied cognition, it bridges research and pedagogy, helping classrooms become linguistically rich, emotionally balanced, and neurologically responsive.

5. Conclusions

Learning in the early years is dynamic and multisensory, with cognition, emotion, language, and movement developing in close interaction. In bilingual and CLIL settings, this interplay is particularly significant, as children must coordinate content learning with an additional language while developing EFs such as attention, working memory, and self-regulation.

The Bilateral Integration Programme translates neuroscientific insights into practical classroom strategies through short, daily routines that stimulate interhemispheric communication and prepare both neurotypical and neurodivergent learners for cognitively

demanding lessons. The programme promotes equity and classroom readiness, aligning with the competence-based principles of the *LOMLOE* and European education frameworks.

Theoretical and preliminary evidence indicate strong potential, though classroom implementation remains the next essential step. Pilot studies should examine feasibility, effects on attention and regulation, and adaptability across diverse contexts. With sustained teacher training and contextual flexibility, this innovation could provide a scalable and sustainable means of enhancing EF and bilingual learning in early education, creating classrooms that are both evidence-based and inclusive.

References

Aboitiz, F., Scheibel, A. B., Fisher, R. S., & Zaidel, E. (1992). Fiber composition of the human corpus callosum. *Brain Research*, 598(1–2), 143–153. [https://doi.org/10.1016/0006-8993\(92\)90178-C](https://doi.org/10.1016/0006-8993(92)90178-C)

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (5th ed.)*. American Psychiatric Publishing. <https://www.federaciocatalanatdah.org/wp-content/uploads/2018/12/dsm5-manualdiagnosticoyestadisticodelostrastornosmentales-161006005112.pdf>

Andreou, M., & Skrimpa, V. (2022). Re-Examining Labels in Neurocognitive Research: Evidence from Bilingualism and Autism as Spectrum-Trait Cases. *Brain Sciences*, 12, Article 1113. <https://doi.org/10.3390/brainsci12081113>

Andreou, M., Tsimpli, I. M., Durrleman, S., & Peristeri, E. (2020). Theory of Mind, Executive Functions, and Syntax in Bilingual Children with Autism Spectrum Disorder. *Languages*, 5(4), 67. <https://doi.org/10.3390/languages5040067>

Bialystok, E., Craik, F. I., & Luk, G. (2012). Bilingualism: Consequences for mind and brain. *Trends in Cognitive Sciences*, 16(4), 240–250. <https://doi.org/10.1016/j.tics.2012.03.001>

Bloom, J. S., & Hynd, G. W. (2005). The role of the corpus callosum in interhemispheric transfer of information: Excitation or inhibition?. *Neuropsychology Review*, 15(2), 59–71. <https://doi.org/10.1007/s11065-005-6252-y>

Boyle, C. M. (2007). An analysis of the efficacy of a motor skills training programme for young people with Moderate Learning Difficulties. *International Journal of Special Education*, 22(1). <https://hdl.handle.net/10871/24631>

Bowlby, M., & Eveson-Egler, J. (2024, March 5). *Autism + ADHD*. Association for Autism and Neurodiversity (AANE). <https://aane.org/autism-info-faqs/library/autism-adhd>

Carballo Márquez, A., & Portero Tresserra, M. (2018). *Neurociencia y educación: Aportaciones para el aula*. Graó.

Casas Pedrosa, A. V., & Rascón Moreno, D. (2023). Attention to diversity in bilingual education: student and teacher perspectives in Spain. *International Journal of Bilingual Education and Bilingualism*, 26(9), 1111–1128. <https://doi.org/10.1080/13670050.2021.1997902>

- Coggins, P. E., Kennedy, T. J., & Armstrong, T. A. (2004). Bilingual corpus callosum variability. *Brain and Language*, 89(1), 69–75. <https://www.sciencedirect.com/science/article/pii/S0093934X03002992>
- Costa, A. (2012). *El cerebro bilingüe*. Editorial Debate.
- Council of the European Union. (2025, August 21). *Council recommendation on key competences for lifelong learning*. European Commission. <https://education.ec.europa.eu/focus-topics/improving-quality/key-competences>
- Courchesne, E., Campbell, K., & Solso, S. (2007). Brain growth across the life span in autism: Age-specific changes in anatomical pathology. *Brain Research*, 1380, 138–145. <https://www.sciencedirect.com/science/article/pii/S0006899310021670?via%3Dihub>
- Craig, F., Lamanna, A. L., Margari, F., Matera, E., Simone, M., & Margari, L. (2015). Overlap Between Autism Spectrum Disorders and Attention Deficit Hyperactivity Disorder: Searching for Distinctive/Common Clinical Features. *Autism Research*. <https://doi.org/10.1002/aur.1449>
- Demopoulos, C., Yu, N., Tripp, J., Mota, N., Brandes-Aitken, A. N., Desai, S. S., Hill, S. S., Antovich, A. D., Harris, J., Honma, S., Mizuri, D., Nagarajan, S. S., & Marco, E. J. (2017). Magnetoencephalographic Imaging of Auditory and Somatosensory Cortical Responses in Children with Autism and Sensory Processing Dysfunction. *Frontiers in Human Neuroscience*, 11, 259. <https://doi.org/10.3389/fnhum.2017.00259>
- Dennison, P. E., & Dennison, G. E. (1986). *Brain Gym: Simple activities for whole brain learning*. Edu-Kinesthetics, Inc.
- Di Martino, A., Fair, D. A., Kelly, C., Satterthwaite, T. D., Castellanos, F. X., Thomason, M. E., ... & Milham, M. P. (2013). Unraveling the miswired connectome: A developmental perspective. *Neuron*, 83(6), 1335–1353. <https://doi.org/10.1016/j.neuron.2014.08.050>
- Diamond, A. (2013). Executive functions. *Annual Review of Psychology*, 64, 135–168. <https://doi.org/10.1146/annurev-psych-113011-143750>
- Diamond, A., & Ling, D. S. (2019). Review of the evidence on, and fundamental questions about, efforts to improve executive functions, including working memory. In J. M. Novick, M. F. Bunting, M. R. Dougherty, & R. W. Engle (Eds.). *Cognitive and working memory training: Perspectives from psychology, neuroscience, and human development* (pp. 146–431). Oxford University Press. <https://doi.org/10.1093/oso/9780199974467.003.0008>
- Digard, B. G., Durrleman, S., Modyanova, N., Reetzke, R., González-Barrero, A. M., & Libben, G. (2023). Raising bilingual autistic children in the UK: Intersection between neurological and language diversity. *Frontiers in Psychiatry*, 14, 1250199. <https://doi.org/10.3389/fpsy.2023.1250199>
- Education Endowment Foundation & RAND Europe. (2020). *Nuffield Early Language Intervention (NELI): Evaluation report*. <https://www.rand.org/randeurope/research/projects/2020/neli-evaluation-nuffield-early-language-intervention.html>
- Eigsti, I.-M., de Marchena, A. B., Schuh, J. M., & Kelley, E. (2011). Language acquisition in autism spectrum disorders: A developmental review. *Research in Autism Spectrum Disorders*, 5(2), 681–691. <https://doi.org/10.1016/j.rasd.2010.09.001>

European Agency for Special Needs and Inclusive Education. (2021). *Key principles – Supporting policy development and implementation for inclusive education*. www.european-agency.org/activities/KeyPrinciples.

European Commission. (2020, September 30). *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on achieving the European Education Area by 2025* (COM (2020) 625 final). Publications Office of the European Union. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020IR4756>.

Fair, D. A., Posner, J., Nagel, B. J., Bathula, D., Dias, T. G. C., Mills, K. L., ... & Nigg, J. T. (2012). Atypical default network connectivity in youth with ADHD. *Biological Psychiatry*, 68(12), 1084–1091. <https://doi.org/10.1016/j.biopsych.2010.07.003>

Felton, A., Vázquez, D., Ramos-Núñez, A. I., Greene, M. R., Macbeth, A., Hernández, A. E., & Chiarello, C. (2017). Bilingualism influences structural indices of interhemispheric organization. *Journal of Neurolinguistics*, 42, 1–11. <https://doi.org/10.1016/j.jneuroling.2016.10.004>

Ferré Veciana, J., & Aribau Montón, E. (2008). *El desarrollo neurofuncional del niño y sus trastornos* (1.^a ed.). Lebón.

Fields, R. D. (2008). White matter in learning, cognition and psychiatric disorders. *Trends in Neurosciences*, 31(7), 361–370. <https://doi.org/10.1016/j.tins.2008.04.001>

Fields, R. D. (2010). Change in the brain's white matter. *Science*. <https://doi.org/10.1126/science.1199139>

Frazier, T. W., & Hardan, A. Y. (2009). A meta-analysis of the corpus callosum in autism. *Biological Psychiatry*, 66(10), 935–941. <https://doi.org/10.1016/j.biopsych.2009.07.022>

Friederici, A. D. (2011). The brain basis of language processing: From structure to function. *Physiological Reviews*, 91(4), 1357–1392. [https://doi.org/10.1152/physrev.00006.2011:contentReference\[oaicite:1\]{index=1}](https://doi.org/10.1152/physrev.00006.2011:contentReference[oaicite:1]{index=1})

Friederici, A. D., Brauer, J., & Lohmann, G. (2011). Maturation of the language network: From inter- to interhemispheric connectivities. *Trends in Cognitive Sciences*, 15(8), 323–331. <https://doi.org/10.1016/j.tics.2011.05.006>

Gazerani, P. (2025). The neuroplastic brain: current breakthroughs and emerging frontiers. *Brain Research*, 1858, 149643. <https://doi.org/10.1016/j.brainres.2025.149643>

Gazzaniga, M. S. (2005). Forty-five years of split-brain research and still going strong. *Nature Reviews Neuroscience*, 6(8), 653–659. <https://doi.org/10.1038/nrn1723>

Geurts, H. M., & Embrechts, M. (2008). Language profiles in ASD, SLI, and ADHD. *Journal of Autism and Developmental Disorders*, 38, 1931–1943. <https://doi.org/10.1007/s10803-008-0587-1>

Giedd, J. N., & Rapoport, J. L. (2010). Structural MRI of Pediatric Brain Development: What Have We Learned and Where Are We Going? *Neuron*, 67(5), 728–734. <https://doi.org/10.1016/j.neuron.2010.08.040>

Giraud, A.-L., & Poeppel, D. (2012). Cortical oscillations and speech processing: emerging computational principles and operations. *Nature Neuroscience*, 15(4), 511–517. <https://doi.org/10.1038/nn.3063>

- Glenberg, A. M., & Gallese, V. (2012). Action-based language: A theory of language acquisition, comprehension, and production. *Cortex*, 48(7), 905–922. <https://doi.org/10.1016/j.cortex.2011.04.010>
- Goswami, U., & Leong, V. (2013). Speech rhythm and temporal structure: Converging perspectives? *Laboratory Phonology*, 4(1), 67–92. <https://doi.org/10.1515/lp-2013-0004>
- Helland, W. A., Biringer, E., Helland, T., & Heimann, M. (2010). Exploring Language Profiles for Children With ADHD and Children With Asperger Syndrome. *Journal of Attention Disorders*, 16(1), 34–43. <https://doi.org/10.1177/1087054710378233>
- Hensch, T. K. (2005). Critical period plasticity in local cortical circuits. *Nature Reviews Neuroscience*, 6(11), 877–888. <https://doi.org/10.1038/nrn1787>
- Hofer, S., & Frahm, J. (2006). Topography of the human corpus callosum revisited—Comprehensive fiber tractography using diffusion tensor magnetic resonance imaging. *Neuroimage*, 32(3), 989–994. <https://doi.org/10.1016/j.neuroimage.2006.05.044>
- Holmes, J., Adams, J. W., & Hamilton, C. (2014). Children with low working memory and children with ADHD: same or different? *Frontiers in Human Neuroscience*, 8, Article 976. <https://doi.org/10.3389/fnhum.2014.00976>
- Howard, K. B., Katsos, N., & Gibson, J. L. (2019). The school experiences of bilingual children on the autism spectrum: An interpretative phenomenological analysis. *Research in Developmental Disabilities*, 87, 9–20. <https://doi.org/10.1016/j.ridd.2019.01.008>
- Hulme, C., West, G., Ríos Díaz, M., Hearne, S., Korell, C., Duta, M., & Snowling, M. J. (2025). The Nuffield Early Language Intervention (NELI) programme is associated with lasting improvements in children's language and reading skills. *Journal of Child Psychology and Psychiatry*, 66(9), 1357–1365. <https://doi.org/10.1111/jcpp.14157>
- Jensen, E. (1998). *Teaching with the brain in mind*. Association for Supervision and Curriculum Development.
- Johnson, J. S., & Newport, E. L. (1991). Critical period effects on universal properties of language: The status of subadjacency in the acquisition of a second language. *Cognition*, 39(3), 215–258. [https://doi.org/10.1016/0010-0277\(91\)90054-8](https://doi.org/10.1016/0010-0277(91)90054-8)
- Justus, S. A., Pogue, E. M., & Simanovich, V. (2025). Pre-K–12 Teachers' Views on ASD+ADHD: Prevalence Estimates and Teaching Preparedness. *Children*, 12, 342. <https://doi.org/10.3390/children12030342>
- Kana, R. K., Keller, T. A., Minshew, N. J., & Just, M. A. (2014). Inhibitory control in high-functioning autism: Decreased activation and underconnectivity in inhibition networks. *Biological Psychiatry*, 62(3), 198–206. <https://doi.org/10.1016/j.biopsych.2006.08.004>
- Kennedy, T. J. (2006). Language learning and its impact on the brain: Connecting language learning with the mind through content-based instruction. *Foreign Language Annals*, 39(3), 471–486.
- Köder, F., Dijk, M. L., & Kootstra, G. J. (2022). The effects of bilingualism on cognition and behaviour in individuals with attention deficits: A scoping review. *Frontiers in Psychology*, 13, 1057501. <https://doi.org/10.3389/fpsyg.2022.1057501>

-
- Korrel, H., Mueller, K. L., Silk, T., Anderson, V., & Sciberras, E. (2017). Language problems in children with Attention-Deficit Hyperactivity Disorder – a systematic meta-analytic review. *Journal of Child Psychology and Psychiatry*, 58(6), 640–654. <https://doi.org/10.1111/jcpp.12688>
- Kuhl, P. K. (2010). Brain mechanisms in early language acquisition. *Neuron*, 67(5), 713–727. <https://doi.org/10.1016/j.neuron.2010.08.038>
- Kuhl, P. K. (2011). Early language learning and literacy: Neuroscience implications for education. *Mind, Brain, and Education*, 5(3), 128–142. <https://doi.org/10.1111/j.1751-228X.2011.01121.x>
- Le Cunff, A.-L., Dommett, E., & Giampietro, V. (2024). Neurophysiological measures and correlates of cognitive load in attention-deficit/hyperactivity disorder (ADHD), autism spectrum disorder (ASD), and dyslexia: A scoping review and research recommendations. *European Journal of Neuroscience*, 59(2), 256–282. <https://doi.org/10.1111/ejn.16201>
- Lebel, C., & Deoni, S. (2018). The development of brain white matter microstructure. *NeuroImage*, 182, 207–218. <https://doi.org/10.1016/j.neuroimage.2017.12.097>
- Lenroot, R. K., & Giedd, J. N. (2006). Brain development in children and adolescents: Insights from anatomical magnetic resonance imaging. *Neuroscience & Biobehavioral Reviews*, 30(6), 718–729. <https://doi.org/10.1016/j.neubiorev.2006.06.001>
- Luk, G., Bialystok, E., Craik, F. I. M., & Grady, C. L. (2011). Lifelong bilingualism maintains white matter integrity in older adults. *Journal of Neuroscience*, 31(46), 16808–16813. <https://doi.org/10.1523/JNEUROSCI.4563-11.2011>
- Lukito, S., Norman, L., Carlisi, C., Radua, J., Hart, H., Simonoff, E., & Rubia, K. (2020). Comparative meta-analyses of brain structural and functional abnormalities during cognitive control in attention-deficit/hyperactivity disorder and autism spectrum disorder. *Psychological Medicine*, 50(6), 894–919. <https://doi.org/10.1017/S0033291720000574>
- Macedonia, M. (2019). Embodied learning: Why at school the mind needs the body. *Frontiers in Psychology*, 10, 2098. <https://doi.org/10.3389/fpsyg.2019.02098>
- Mackey, A. P., Whitaker, K. J., & Bunge, S. A. (2012). Experience-dependent plasticity in white matter microstructure: reasoning training alters structural connectivity. *Frontiers in Neuroanatomy*, 6, Article 32. <https://doi.org/10.3389/fnana.2012.00032>
- Madrid, D., & Pérez Cañado, M. L. (2018). Addressing diversity in CLIL: Current approaches and practices. *Latin American Journal of Content and Language Integrated Learning*, 11(1), 9–32. <https://doi.org/10.5294/laclil.2018.11.1.1>
- Madrid, D., & Pérez Cañado, M. L. (2018). Innovations and challenges in attending to diversity through CLIL. *Theory Into Practice*, 57(3), 241–249.
- Mathias, B. (2023). *Corpus callosum*. SpeechFit Glossary. <https://speechfit.io/glossary/c/corpus-callosum>.
- Miguel Pérez, V. (n.d.). *Hitos del neurodesarrollo en educación infantil* (Milestones of neurodevelopment in early childhood education). Unpublished document.
- Miguel Pérez, V. (n.d.). *Metodología en Educación Infantil y Aportaciones de la Neurociencia*. Unpublished document.

- Mohades, S. G., Struys, E., Van Schuerbeek, P., Mondt, K., Van De Craen, P., & Luypaert, R. (2012). DTI reveals structural differences in white matter tracts between bilingual and monolingual children. *Brain Research*, 1435, 72–80. <https://doi.org/10.1016/j.brainres.2011.12.005>
- Mostofsky, S. H., Burgess, M. P., & Gidley Larson, J. C. (2009). Increased motor cortex white matter volume predicts motor impairment in autism. *Brain*, 132(Pt 5), 1197–1209. <https://doi.org/10.1093/brain/awm129>
- Negin, E., Farahani, S., Jalaie, S., Barootian, S. S., Pourjavid, A., Eatemadi, M., Kazemiha, M., & Barzegar, M. (2016). Effect of bilingualism on volume of corpus callosum. *International Journal of Paediatric Otorhinolaryngology*, 88, 103–107. <https://doi.org/10.1016/j.ijporl.2016.06.054>
- Nkurunziza, S. (2024). The role of phonological awareness in early reading development. *European Journal of Linguistics*, 3(3), 15–26. www.carijournals.org
- Norbury, C. F., & Sparks, A. (2013). Difference or disorder? Cultural issues in understanding neurodevelopmental disorders. *Developmental Psychology*, 49(1), 45–58. <https://doi.org/10.1037/a0027446>
- Nordahl, C. W., et al. (2015). Sex differences in the corpus callosum in preschool-aged children with autism spectrum disorder. *Molecular Autism*, 6(26). <https://molecularautism.biomedcentral.com/articles/10.1186/s13229-015-0005-4>
- Organisation for Economic Co-operation and Development. (2019). *OECD Learning Compass 2030: A series of concept notes*. OECD Publishing. <https://www.oecd.org/education/2030-project/learning/learning-compass-2030/>.
- Paul, L. K., Brown, W. S., Adolphs, R., Tyszka, J. M., Richards, L. J., Mukherjee, P., & Sherr, E. H. (2007). Agenesis of the corpus callosum: Genetic, developmental, and functional aspects of connectivity. *Nature Reviews Neuroscience*, 8(4), 287–299. <https://doi.org/10.1038/nrn2107>
- Petitto, L. A., Berens, M. S., Kovelman, I., Dubins, M. H., Jasinska, K., & Shalinsky, M. H. (2012). The “Perceptual Wedge Hypothesis” as the basis for bilingual babies’ phonetic processing advantage: New insights from fNIRS brain imaging. *Brain and Language*, 121(2), 130–143. <https://doi.org/10.1016/j.bandl.2011.05.003>
- Pliatsikas, C. (2020). Understanding structural plasticity in the bilingual brain: The dynamic restructuring model. *Bilingualism: Language and Cognition*, 23(3), 459–471. <https://doi.org/10.1017/S1366728919000130>
- Pliatsikas, C., Meteyard, L., Veríssimo, J., DeLuca, V., Shattuck, K., & Ullman, M. T. (2020). The effect of bilingualism on brain development from early childhood to young adulthood. *Brain Structure and Function*, 225(7), 2131–2152. <https://doi.org/10.1007/s00429-020-02115-5>
- Pulvermüller, F., & Fadiga, L. (2010). Active perception: Sensorimotor circuits as a cortical basis for language. *Nature Reviews Neuroscience*, 11(5), 351–360. <https://doi.org/10.1038/nrn2811>
- Pulvermüller, F. (2013). How neurons make meaning: Brain mechanisms for embodied and abstract-symbolic semantics. *Trends in Cognitive Sciences*, 17(9), 458–470. <https://doi.org/10.1016/j.tics.2013.06.004>

-
- Reindal, L., Nærland, T., Weidle, B., Lydersen, S., Andreassen, O. A., & Sund, A. M. (2023). Structural and pragmatic language impairments in children evaluated for autism spectrum disorder (ASD). *Journal of Autism and Developmental Disorders*, 53, 701–719. <https://doi.org/10.1007/s10803-020-04853-1>
- Schirmer, A., & Kotz, S. A. (2006). Beyond the right hemisphere: Brain mechanisms mediating vocal emotional processing. *Trends in Cognitive Sciences*, 10(1), 24–30. <https://doi.org/10.1016/j.tics.2005.11.009>
- Segura, M. (2023). CLIL in Pre-Primary Education: The Views of In-Service and Pre-Service Teachers. *Bellaterra Journal of Teaching & Learning Language & Literature*, 16(2), e1230. <https://doi.org/10.5565/rev/jtl3.1230>
- Seidman, L. J., Valera, E. M., & Makris, N. (2005). Structural brain imaging of attention-deficit/hyperactivity disorder. *Biological Psychiatry*, 57(11), 1263–1272. <https://doi.org/10.1016/j.biopsych.2005.01.023>
- Shams, L., & Seitz, A. R. (2008). Benefits of multisensory learning. *Trends in Cognitive Sciences*, 12(11), 411–417. <https://doi.org/10.1016/j.tics.2008.07.006>
- Shaw, P., Stringaris, A., Nigg, J., & Leibenluft, E. (2014). Emotion dysregulation in attention deficit hyperactivity disorder. *American Journal of Psychiatry*, 171, 276–293. <https://doi.org/10.1176/appi.ajp.2013.13070966>
- Simply Psychology. (2023). *Critical period in brain development and childhood learning*. Simply Psychology. <https://www.simplypsychology.org/critical-period.html>
- Sorge, G. B., Toplak, M. E., & Bialystok, E. (2017). Interactions between levels of attention ability and levels of bilingualism in children's executive functioning. *Developmental Science*, 20, Article e12408. <https://doi.org/10.1111/desc.12408>
- Thapar, A., Cooper, M., Eyre, O., & Langley, K. (2013). What have we learnt about the causes of ADHD?. *Journal of Child Psychology and Psychiatry*, 54(1), 3–16. <https://doi.org/10.1111/j.1469-7610.2012.02611.x>
- Thapar, A., Cooper, M., & Rutter, M. (2017). Neurodevelopmental disorders. *The Lancet Psychiatry*, 4(4), 339–346. [https://doi.org/10.1016/S2215-0366\(16\)30376-5](https://doi.org/10.1016/S2215-0366(16)30376-5)
- Thomas, M. S. C., & Johnson, M. H. (2008). New advances in understanding sensitive periods in brain development. *Current Directions in Psychological Science*, 17(1), 1–5. <https://journals.sagepub.com/doi/full/10.1111/j.1467-8721.2008.00537.x>
- Travers, B. G., Adluru, N., Ennis, C., Tromp do, P. M., Destiche, D., Doran, S., ... & Alexander, A. L. (2015). Diffusion tensor imaging in autism spectrum disorder: A review. *Autism Research*, 8(3), 386–392. <https://doi.org/10.1002/aur.1476>
- Uddin, L. Q., Supekar, K., & Menon, V. (2013). Reconceptualizing functional brain connectivity in autism from a developmental perspective. *Frontiers in Human Neuroscience*, 7, 458. <https://doi.org/10.3389/fnhum.2013.00458>

Uddin, L. Q., Dajani, D. R., Voorhies, W., Bednarz, H., & Kana, R. K. (2017). Progress and roadblocks in the search for brain-based biomarkers of autism and ADHD. *Translational Psychiatry*, 7(8), e1218. <https://doi.org/10.1038/tp.2017.164>

Uljarević, M., Evans, D. W., & Alvares, G.A., Whitehouse, A. J. O. (2016). Short report: relationship between restricted and repetitive behaviours in children with autism spectrum disorder and their parents. *Molecular Autism*, 7, 29. <https://doi.org/10.1186/s13229-016-0091-y>

Vaidya, C. J., & Stollstorff, M. (2008). Cognitive neuroscience of attention deficit hyperactivity disorder: Current status and working hypotheses. *Developmental Disabilities Research Reviews*, 14(4), 261–267. <https://doi.org/10.1002/ddrr.40>

Van der Knaap, L. J., & Van der Ham, I. J. M. (2011). How does the corpus callosum mediate interhemispheric transfer? A review. *Behavioural Brain Research*, 223(1), 211–221. <https://doi.org/10.1016/j.bbr.2011.04.018>

Wei, X., Gunter, T. C., Adamson, H., McWhinney, B. C., Pliatsikas, C., & Anwender, A. (2024). White matter plasticity during second language learning within and across hemispheres. *Proceedings of the National Academy of Sciences of the United States of America*, 121(2), e2306286121. <https://doi.org/10.1073/pnas.2306286121>

Werker, J. F., & Hensch, T. K. (2015). Critical periods in speech perception: New directions. *Annual Review of Psychology*, 66, 173–196. https://acesin.letras.ufrj.br/wp-content/uploads/2023/08/critical_period.pdf

Wu, Z.-M., Wang, P., Liu, X.-C., Zhou, Q.-C., Cao, X.-L., Sun, L., Liu, L., Cao, Q.-J., Yang, L., Wang, Y.-F., Qian, Y., & Yang, B.-R. (2025). Functional and structural connectivity of the subregions of the amygdala in ADHD children with or without ODD. *BMC Psychiatry*, 25(74). <https://doi.org/10.1186/s12888-025-06500-4>

Yoro, A. J., Fourie, J. V., & Van der Merwe, M. (2020). Learning support strategies for learners with neurodevelopmental disorders: Perspectives of recently qualified teachers. *African Journal of Disability*, 9, a561. <https://doi.org/10.4102/ajod.v9i0.561>

Zelazo, P. D., Blair, C. B., & Willoughby, M. T. (2016). *Executive function: Implications for education (NCER 2017-2000)*. National Center for Education Research, Institute of Education Sciences, U.S. Department of Education. <https://ies.ed.gov/ncer/pubs/20172000/>.

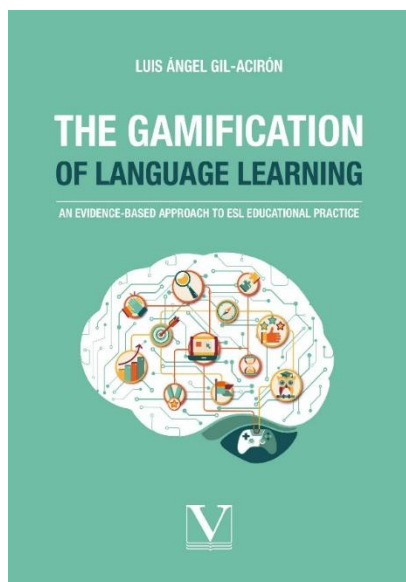
Zhang, Y., Qin, B., Wang, L., Zhang, K., Song, C., Chen, J., Cai, J., & Li, T. (2022). Corpus callosum volumes in children with autism spectrum disorders: Sex- associated differences. *Journal of Autism and Developmental Disorders*, 53(6), 2421–2429. <https://doi.org/10.1007/s10803-022-05538-7>

BOOK REVIEW

Gil-Acirón, L. Á. (2025). *The Gamification of Language Learning: An Evidence-Based Approach to ESL Educational Practice*. Editorial Verbum. 342 pp. ISBN: 978-84-1136-811-7

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Luis Ángel Gil-Acirón's *The Gamification of Language Learning: An Evidence-Based Approach to ESL Educational Practice*, a book that has been recipient of the academic award V Premio de Investigación Filológica "Profesor José Romera Castillo", represents a significant scholarly contribution to the intersecting fields of second language acquisition, educational technology, and pedagogical innovation. Published by Editorial Verbum in 2025, this volume addresses a critical gap in educational research by investigating how systematically designed gamification principles can enhance the learning experiences of newcomer English Language Learners (ELLs) in the United States, specifically examining the impact on affective factors that influence language acquisition success.

The work emerges from Gil-Acirón's three-year experience as a participating teacher in the Spanish Ministry of Education's Visiting Teachers in the USA and Canada program, working with newcomer students at Buchanan Elementary School in Oklahoma City Public Schools. The author documents how 62.9% of the school's 676 students are ELLs, with 83% being economically disadvantaged, and many having experienced traumatic migration journeys. This contextualization establishes both the humanitarian urgency and pedagogical significance of the research, positioning the study within frameworks of educational equity and the United Nations Sustainable Development Goal 4 on Quality Education.

Gil-Acirón's central hypothesis posits that newcomer ELL students' affective filters, encompassing motivation, self-confidence, and anxiety, can be lowered through co-designed language learning gamification experiences in the ESL classroom. The theoretical foundation rests primarily on Stephen Krashen's Affective Filter Hypothesis, which suggests that emotional factors act as barriers or facilitators to language input reaching the Language Acquisition Device. The study's innovative contribution lies in its rigorous empirical examination of how "Class Royale (ESL Edition)", a co-designed gamification program adapted from the popular mobile phone video game *Clash Royale* (2016), impacts these affective dimensions. As Pilar Rodríguez Arancón notes in the foreword, this work stands as "a beacon of innovation and compassion" (Gil-Acirón, 2025, p. 17) by integrating theoretical sophistication with profound empathy for vulnerable student populations.

The monograph is structured in seven chapters organized into four distinctive blocks corresponding to classic research phases: contextualization and theoretical framework (Chapters 1-3), methodology (Chapter 4), results and discussion (Chapters 5-6), and conclusions (Chapter 7).

Chapter 1: Introduction establishes the problem statement, documenting the complex circumstances facing newcomer ELL students who often arrive in the United States undocumented, economically disadvantaged, and having endured traumatic experiences including loss of relatives or detention in Immigration Detention Centers. Gil-Acirón articulates the study's significance in relation to Sustainable Development Goals, specifically targeting Goal 4's aims to "eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable" (UNDP, 2015a, Goal 4 Targets, para. 5) and to "provide safe, nonviolent, inclusive and effective learning environments for all" (UNDP, 2015a, Goal 4 Targets, para. 8). The chapter clearly defines the research hypothesis and two primary objectives: to co-design with students a language learning gamification program, and to apply and evaluate this program's impact on newcomer ELL students' affective filters.

Chapter 2: English Language Learners and Affective Factors provides a comprehensive contextualization of ELL students in the United States, detailing federal definitions, legal frameworks (including the Civil Rights Act of 1964, *Lau v. Nichols* 1974, and the No Child Left Behind Act of 2001), and Oklahoma City Public Schools' English Language Development Program. Gil-Acirón documents specific barriers facing newcomers: linguistic challenges including extended silent periods, difficulty catching up with content-area learning, and the 4-7 years typically required for ELLs to reach academic language proficiency. The chapter's second section offers extensive theoretical review of affective factors in second language acquisition, examining Krashen's Monitor Model hypotheses, Gardner and Lambert's integrative versus instrumental motivation, Dörnyei's L2 Motivational Self System, and theories addressing self-confidence and language anxiety. Significantly, Gil-Acirón incorporates discussion of cultural perspectives on motivation, recognizing Western versus Eastern conceptualizations relevant to his diverse student population. The chapter concludes with evidence-based pedagogical strategies for lowering affective filters, including techniques specific to newcomer students.

Chapter 3: Gamification constitutes the study's most extensive chapter, providing thorough theoretical grounding in gamification fundamentals. Gil-Acirón carefully distinguishes gamification from related concepts including Game-Based Learning, serious games, and simulations, defining gamification as the application of game design elements in non-game contexts. The chapter systematically catalogues gamification elements using multiple taxonomies, including Werbach and Hunter's hierarchy of game dynamics, mechanics, and components, and explores game design principles such as Freytag's Pyramid, the Hero's Journey narrative structure, and Csikszentmihalyi's flow theory. A particularly sophisticated section examines gamer psychology through multiple frameworks: personality traits using the Five-Factor Model, Bartle's player types, Yee's player motivations, and Marczewski's User Type Hexad. Gil-Acirón incorporates cutting-edge neuroscience research, discussing how gamification activates reward systems through neurotransmitters (dopamine, oxytocin, serotonin, and endorphins) and presenting functional Magnetic Resonance Imaging (fMRI) studies demonstrating gamification's effects on the Default Mode Network and Working Memory Network. The chapter concludes by reviewing gamification applications in education generally and second language learning specifically, addressing vocabulary and grammar learning, skills development, soft skills, and assessment.

Chapter 4: Research Methodology develops the mixed-methods cross-sectional experimental design employed to investigate the research questions. Gil-Acirón describes the 24 participating newcomer students (10 first graders, 6 second graders, and 8 fourth, fifth and sixth graders; 22 Hispanic and 2 Vietnamese; 12 male and 12 female). The co-design methodology follows Huang and Soman's five-step educational gamification model: understanding the target audience, defining learning objectives, structuring the experience, identifying resources, and applying gamification elements. Data collection employed triangulation of three techniques: pre-test and post-test surveys using the validated Student Motivational State Questionnaire developed by Guilloteaux and Dörnyei, systematic classroom observations utilizing the Learners' Motivated Behavior Observation Scheme, and focus group discussions. The chapter demonstrates methodological sophistication in addressing ethical considerations for research with vulnerable child populations, including informed consent procedures and provision of materials in participants' native languages (Spanish and Vietnamese).

Chapter 5: Gamification Program Co-Design documents the systematic development and implementation of Class Royale (ESL Edition). Through student surveys identifying *Clash Royale* as the most popular video game, Gil-Acirón and his students collaboratively adapted game elements to educational contexts. The program structure incorporated game mechanics aligned with learning objectives: "Gems" (points) awarded for language skill development, "Arenas" corresponding to didactic units, "Chests" representing behavior and language skills with five-lesson didactic units, "Cards" as rewards with special privileges, "Experience Levels" tracking reward collection, "Battles" as activities designed according to Gardner's Multiple Intelligences theory, "Tournaments" as tests, "Class Market" as temporary reward offerings, and "Grand Challenge" as surprise projects. Gil-Acirón designed a comprehensive visual identity including a website, an infographic poster, classroom displays, and physical cards, ensuring the gamification experience was immersive and professionally executed. Prototype testing with students validated the program design before full implementation.

Chapter 6: Gamification Program Implementation, Results and Discussion presents empirical findings from the 20-week implementation period. Statistical analysis using the Wilcoxon signed-rank test for questionnaire data revealed significant improvements across all three affective factors: motivation items showed 8.5% to 150% increases (with reverse-coded items appropriately interpreted), self-confidence items demonstrated 9.6% to 161.1% gains, and anxiety items indicated 11.1% to 292.9% reductions. Results stratified by age group and gender showed consistent patterns, though with some variation in magnitude. Observational data analyzed using Two-Proportions Z-Test confirmed increased behavioral engagement, with students displaying greater attention, active participation, and eager volunteering during gamified versus non-gamified sessions. Focus group discussions provided rich qualitative data illuminating students' perspectives on how Class Royale (ESL Edition) influenced their learning experiences, with students articulating awareness of the program's impact on their willingness to take linguistic risks and their reduced anxiety about making mistakes.

Gil-Acirón's concluding chapter synthesizes major findings while maintaining scholarly humility about the study's limitations. The research successfully validated the hypothesis that co-designed gamification programs can lower newcomer ELL students' affective filters, with empirical evidence demonstrating improvements in motivation, self-confidence, and reductions in anxiety. The author emphasizes that successful gamification requires more than superficial application of game elements; rather, it demands systematic design grounded in learning theory, meaningful alignment between game mechanics and educational objectives, and genuine student participation in the co-design process.

Pedagogical implications articulated by Gil-Acirón include recommendations that ESL teachers consider gamification as a viable strategy for creating engaging, supportive learning environments that address the emotional needs of vulnerable student populations. The study demonstrates how gamification can provide frequent personalized feedback, create low-stakes contexts for practicing language skills, facilitate social learning through collaborative game mechanics, and transform potentially anxiety-inducing tasks into motivating challenges. Gil-Acirón argues that the co-design methodology was particularly crucial, since involving students as active participants rather than passive recipients honored principles of autonomy and intrinsic motivation central to Self-Determination Theory.

The author candidly acknowledges several limitations that appropriately contextualize the findings. The sample size of 24 students, while adequate for action research, limits generalizability to broader populations. The specific context, newcomer ELLs at a single elementary school, means results may not transfer directly to other settings with different demographic compositions or institutional structures. The 20-week duration, while substantial, raises questions about long-term sustainability of motivational improvements. Gil-Acirón notes the challenge of isolating gamification effects from confounding variables such as novelty effect or researcher enthusiasm, though the triangulation of data sources partially addresses this concern. Importantly, the study focused on affective factors rather than directly measuring language proficiency gains, leaving open questions about whether increased motivation translates into measurable linguistic development.

Gil-Acirón proposes judicious directions for future research that would significantly advance the field. These include longitudinal studies examining sustained effects of gamification on both affective factors and language proficiency outcomes, comparative studies investigating different gamification design types, research examining how cultural factors and individual differences moderate gamification effectiveness, exploration of the relationship between gamification and quality teaching practices, and investigation of scaling possibilities beyond individual classrooms to institutional or district levels. The author's suggestion to study other teachers' experiences implementing Class Royale (ESL Edition) reflects commitment to ensuring the program's replicability and wider applicability.

References

Gil-Acirón, L. Á. (2025). *The Gamification of Language Learning: An Evidence-Based Approach to ESL Educational Practice*. Editorial Verbum.