

Sustaining innovation: Teacher perspectives on content and language integrated learning (CLIL) and digital tool integration in Albanian online education

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ABSTRACT

This study explores the perceptions and experiences of secondary school teachers in Albania who implemented Content and Language Integrated Learning (CLIL) combined with digital tools, particularly EdPuzzle, in teaching natural sciences subjects during and after the COVID-19 pandemic (online and face to face). The research focuses on understanding the long-term impact of these methodologies on teaching practices and their potential for continued use in an ever-changing educational landscape. A phenomenological approach was employed to gather in-depth insights through semi-structured interviews, capturing thirty language and natural sciences teachers' reflections on the benefits, challenges, and future possibilities of integrating CLIL with video-based learning tools. Using phenomenological approach, the findings reveal that the teachers observed significant improvements in student engagement, comprehension, and autonomy through the use of CLIL and EdPuzzle. However, they also highlighted challenges related to technological access and the need for ongoing professional development. The study concludes that while the innovative teaching methods fostered during the pandemic have the potential for sustainable use, their success hinges on continued support and adaptation to the evolving educational context in Albania. Recommendations include the integration of CLIL into broader curriculum design, the provision of resources and training for teachers, and further research into the scalability of these practices across different educational settings.

Introduction

The COVID-19 pandemic prompted a sudden and widespread shift to online learning, necessitating rapid adaptation by educators worldwide. In Albania, where traditional pedagogical approaches have long dominated [1], the shift to remote learning created an unprecedented opportunity to explore innovative teaching methods that could address the country's longstanding educational challenges. One such method, Content and Language Integrated Learning (CLIL), which has gained momentum in the recent years integrates subject matter with language learning, fostering cognitive development and enhancing students' language proficiency through immersive, bilingual education [2,3]. Combined with digital tools such as EdPuzzle, which allows teachers to create interactive video content that engages students in active learning, CLIL offers a promising approach to reinvigorating Albanian education [4].

However, Albania's educational system faces systemic challenges, including limited access to technology, uneven professional development opportunities, and a curriculum that has historically prioritized rote learning over critical thinking and engagement [5,6,1]. Despite these challenges, the pandemic catalyzed a shift towards integrating digital tools and innovative pedagogies, providing a unique context in which to examine their efficacy and potential for long-term adoption.

The COVID-19 pandemic has accelerated the shift towards online education, presenting unique challenges and opportunities for educators worldwide. Among the innovative responses to these challenges is the integration of CLIL with video-based teaching tools, such as EdPuzzle. CLIL, traditionally used in face-to-face education, combines language learning with subject content, offering a holistic approach that enhances both language proficiency and subject comprehension. While its effectiveness in traditional classrooms is well-documented, its application in online environments remains underexplored [7].

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This study seeks to bridge this gap by investigating the impact of CLIL and video integration in online natural sciences subject education (physics, biology, chemistry), specifically focusing on the experiences of educators and students in Albania. It seeks to elucidate how these innovations influenced their teaching practices, student engagement, and learning outcomes, and to consider the broader implications for educational reform in Albania. By documenting these teachers' experiences, this research contributes to the growing body of literature on the potential of CLIL and digital tools to modernize education in traditionally conservative contexts, as well as to provide insights into the effectiveness of these methods in promoting student engagement, comprehension, and autonomy. Albania in particular has been under-represented in the literature on CLIL and educational technology, thus the contextual focus is a key strength of the study, offering perspectives that enrich broader international debates.

Literature review

Content and Language Integrated Learning (CLIL), a term introduced by [8], refers to teaching a subject or selected topics through a foreign language, enabling learners to develop subject knowledge and language proficiency simultaneously. Coyle, Hood, and Marsh [9] further define CLIL as a dual-focused approach supported by language-oriented methodologies that balance attention between content and language learning. Their 4Cs Framework—Content, Communication, Cognition, and Culture—remains the most influential and comprehensive theoretical model for understanding CLIL pedagogy. Its integration into educational practices has gained substantial global attention [10], particularly as a means of enhancing both subject-specific knowledge and language proficiency. This approach, which combines the learning of a subject with the acquisition of a second language, has been typically studied in face-to-face classroom settings, with a strong emphasis on its impact on student motivation, engagement, and on language and academic achievement [11]. Recent studies have expanded this exploration into virtual environments [12–15], especially in response to the shift towards online learning due to the COVID-19 pandemic.

In an Albanian case study, CLIL was integrated with video content in a natural sciences subject class, which significantly enhanced student motivation, comprehension, and engagement during online teaching. The use of real-world examples and personalization was found to kindle intrinsic motivation, while language accessibility and multimodal learning enriched comprehension [16]. Similarly, the use of digital tools like Genially and Kahoot in a university setting demonstrated that these technologies, when combined with CLIL, significantly boost student motivation and engagement, enhancing language skills and promoting subject-specific comprehension [17]. Furthermore, the integration of web-based applications and augmented reality into CLIL programs in higher education and secondary schools has shown substantial educational benefits, including a positive impact on students' language skills development and motivation to learn, although it requires special training and adaptation to the learning environment [18,3]. The use of online communication technologies, such as virtual exchange, has also been highlighted as a promising method to support the development of students' foreign language skills and intercultural competence in CLIL contexts [7].

Overall, these studies underscore the potential of CLIL to transform educational practices by promoting inclusivity, autonomy, and international collaboration, even in virtual learning environments. The integration of innovative approaches and technological tools offers valuable opportunities to enhance both language proficiency and subject-specific knowledge.

CLIL in face-to-face and online education

Historically, CLIL has been lauded for its ability to simultaneously improve linguistic abilities and deepen content understanding [19]. In

face-to-face settings, studies have shown that CLIL not only enhances students' language skills but also boosts their comprehension of complex subjects, such as science and mathematics [20,21]. The interactive nature of CLIL, which encourages active participation and contextualized learning, has been identified as a key factor in its success [2].

As the educational landscape shifted to online platforms during the pandemic, the adaptability of CLIL to virtual environments became a topic of interest. Researchers like Hüttner & Smit [22] suggested that the integration of content and language learning could be effectively adapted to online platforms, given the appropriate technological tools and pedagogical strategies. This adaptability was seen as particularly advantageous in maintaining student engagement and motivation, which are often challenged in online learning contexts [23,15].

Multimodal learning and student engagement

The role of multimodal learning in enhancing student engagement and comprehension has been increasingly recognized in the context of online education [24]. Multimodal learning involves the use of various modes of communication, such as visual, auditory, and kinesthetic, to deliver content and facilitate learning. The integration of multiple modalities is believed to cater to diverse learning styles, thereby improving comprehension and retention [25].

In online education, the use of video as a multimodal tool has gained prominence. Studies have shown that video integration can significantly enhance students' understanding of complex concepts by providing visual and auditory stimuli that complement textual information [26]. Moreover, interactive video platforms, such as EdPuzzle, have been highlighted for their ability to foster personalized and self-directed learning. By embedding questions and prompts within videos, EdPuzzle encourages active learning and provides immediate feedback, which can enhance student autonomy and engagement [27,28].

The impact of CLIL and video integration on online natural sciences subject education

The integration of CLIL and video-based tools in online natural sciences subject education represents a convergence of two powerful pedagogical approaches. Natural sciences subjects often present challenges to students due to their abstract concepts and mathematical rigor. The use of CLIL in teaching natural sciences subjects can make these concepts more accessible by simultaneously addressing language barriers and content difficulties [22]. Moreover, the use of video tools like EdPuzzle can further enhance comprehension by providing visual explanations and interactive elements that engage students in active problem-solving [26].

Several studies explore the specific impact of these combined approaches in online education. For example, a study by Di Martino and Di Sabato [29] found that the use of CLIL in conjunction with video tools significantly improved students' understanding of natural sciences subject concepts and their ability to apply these concepts in real-world contexts. Similarly, research by De La Maya Retamar and Luengo González [28] demonstrated that students who engaged with interactive video content in a CLIL framework showed higher levels of motivation and were more likely to engage in self-directed learning.

Challenges and opportunities in implementing CLIL and video integration

While the potential benefits of CLIL and video integration in online education are evident, several challenges must be addressed to optimize their implementation. One significant challenge is the need for professional development among educators. Teachers must be equipped with the skills and knowledge to effectively integrate CLIL principles and video tools into their teaching practices [30]. Additionally, the cultural and linguistic diversity of students in online environments necessitates careful consideration of language accessibility and the provision of

support for non-native speakers [21].

Despite these challenges, the opportunities presented by CLIL, and video integration are substantial. The ability to create personalized, interactive, and contextually relevant learning experiences can transform online education, making it more engaging and effective for students [3]. As online learning continues to evolve, the insights gained from studies on CLIL, and video integration will be crucial in guiding the development of innovative pedagogical strategies.

The literature underscores the transformative potential of CLIL and video integration in online education, particularly in subjects like natural sciences that require a deep understanding of complex concepts. The combination of content and language learning with multimodal instructional tools such as EdPuzzle offers a promising approach to enhancing student engagement, comprehension, and autonomy. As educators continue to adapt to the demands of online education, further research is needed to explore the scalability and adaptability of these approaches across diverse educational settings. In this context, the present study makes a distinctive novel contribution as to our knowledge, it is among the first studies to examine the combined use of CLIL and Educational technology apps in the Albanian education system, where exposure to such integrated methodologies has historically been limited.

Methodology

Aim and objectives

The primary aim of this research is to explore and understand the perspectives of teachers who have implemented CLIL alongside video-based tools, such as EdPuzzle, in their teaching practice. The study seeks to uncover how these educators perceive the integration of CLIL and technology in their instructional methods, how they have adapted these tools post-pandemic, and what future potential they see in continuing or expanding their use.

Research questions

1. How do teachers describe their experiences and perceptions of using CLIL and video-based tools during online instruction?
2. What challenges and benefits do teachers identify when integrating CLIL and digital technologies into their teaching practice?
3. In what ways, if at all, have teachers continued to use CLIL and video-based tools after returning to in-person or hybrid teaching?
4. How do teachers perceive the future potential of CLIL and video-based tools for improving teaching and learning outcomes?

Method

A qualitative phenomenological approach was employed to explore the perspectives of thirty secondary school teachers in Albania who integrated CLIL with EdPuzzle during the COVID-19 pandemic. Phenomenological studies provide a rigorous qualitative approach for uncovering the depth and complexity of lived experiences, grounded in Husserl's (1859–1938) philosophy but adapted through various traditions [31]. The approach is distinguished by its focus on subjective meaning, bracketing of assumptions, and rich, detailed descriptions of experience [32]. Phenomenology is particularly suited to research that seeks to capture the essence of participants' lived experiences and the meanings they ascribe to them [33]. Since the aim of this study was not to measure the effectiveness of CLIL and EdPuzzle quantitatively, but to understand how teachers experienced, interpreted, and adapted these practices within their specific educational and cultural contexts, a qualitative lens was essential.

This theoretical framing aligns with constructivist paradigms, which view knowledge as actively constructed through experience and social interaction. Drawing on Piaget's notion that learners build

understanding through engagement with their environment (1972) [34] and Vygotsky's emphasis on the social and cultural mediation of learning (1978) [35], this perspective supports the use of phenomenological methods to capture how participants interpret and give meaning to their experiences. By foregrounding teachers' voices, phenomenology allowed us to capture the depth and complexity of their experiences, including both challenges and perceived benefits. Furthermore, this approach enabled the researchers to situate individual stories within the broader systemic context of Albanian education, thus offering insights into the interplay between innovation, policy, and practice.

In line with recent calls for transparent and structured reporting of qualitative research (see, for example, [36]), the methodology was designed and described to allow clarity, replicability, and trustworthiness. This included explicit detailing of participant recruitment, instrument design, data collection procedures, and the thematic analysis process.

Context

This study is situated in the context of secondary school education in Albania, focusing on 15 pairs of educators composed of a subject teacher in natural sciences (biology, chemistry, physics) and an English teacher who collaborated during the COVID-19 pandemic to implement CLIL using video-based tools like EdPuzzle. These team-teachers were involved in an innovative educational initiative aimed at maintaining student engagement and learning outcomes during the transition to online education.

The subject teacher was responsible for delivering subject content, while the English teacher provided language support, ensuring that the CLIL approach effectively combined both content knowledge and language acquisition. Their collaboration was pivotal in adapting traditional teaching methods to the online environment, using EdPuzzle to create interactive and engaging lessons for secondary school students.

Participants

This qualitative study focuses on 15 team-teachers' pairs (natural sciences and English) to provide an interdisciplinary perspective. Pairing natural sciences and English teachers constitutes a methodological strength of this study, as it captures the collaborative dimension of CLIL implementation and yields a more authentic, holistic understanding than single-teacher perspectives alone. The access to educators who are often difficult to reach for academic research, especially during and after the disruptions of the pandemic is yet another strong point of this research. Their insights provide authentic reflections on innovation in constrained condition.

Participants were recruited through purposive sampling within the professional development network of the educational initiative aimed at training teachers in using CLIL. Invitations were sent to 40 teacher pairs, of which 22 pairs consented to participate. Five pairs declined due to scheduling constraints and the other teachers were not selected because at least one of them did not fulfill the criteria. Of the 15 pairs selected, follow-up reminders were used to encourage participation (Table 1).

The selection of participants was guided by specific criteria to ensure relevance and depth in exploring the implementation of CLIL and digital tools during the pandemic. These criteria included:

- Professional development participation: Only teachers who participated in a professional development project introducing CLIL to 80 secondary school educators in Albania (40 English and 40 subject teachers) were contacted.
- Experience with CLIL: Teachers who actively used CLIL during the pandemic were selected.
- Collaboration history: Teachers were selected as pairs who had worked collaboratively to integrate subject content and language learning.

Table 1
Participant Profile (N = 30 teachers, 15 pairs).

Variable	Categories	N	%
Subject taught	Natural Sciences: (Biology (N = 6), Chemistry (N = 4), Physics (N = 5)	15	50
	English	15	50
			%
Gender	Female	21	70
			%
	Male	9	30
			%
School location	Urban	12 pairs (24 teachers)	80
			%
	Rural	3 pairs (6 teachers)	20
			%
Years teaching experience	1–5 years	6	20
			%
	6–10 years	8	27
			%
	11–15 years	10	33
			%
	16+ years	6	20
			%

- Geographical diversity: Participants were selected from both urban and rural areas to capture a range of contexts and challenges.

Research design and data collection

The research employs a phenomenological approach to capture the lived experiences and perceptions of the fifteen pairs of teachers. This approach is particularly suited for exploring the subjective experiences of individuals who have undergone a specific phenomenon — in this case, the integration of CLIL and EdPuzzle in online and subsequent teaching practices.

Data were collected through in-depth, semi-structured interviews conducted with each teacher. These interviews, conducted two years after the COVID-19 teaching experience, were designed to elicit detailed reflections on their experiences with CLIL and EdPuzzle during online teaching, their perceptions of the benefits and challenges, and their subsequent use of these tools in their current teaching practice. Interviews lasted on average 50 min, and were conducted primarily online via Zoom, reflecting the teachers' comfort with digital platforms. An interview guide was developed specifically for this study, drawing on prior CLIL and educational technology frameworks [2,37], and was piloted with two non-participating teachers to refine clarity and sequencing. The final guide, included in [Appendix A](#), contained open-ended questions covering initial implementation, perceived benefits and challenges, continued use, and future perspectives.

The interviews were structured around several key themes:

- Initial implementation: Teachers described their first experiences with CLIL and EdPuzzle during the shift to online teaching, including challenges faced and solutions found.
- Perceived benefits and challenges: Discussions centered on how these methods impacted student engagement, comprehension, and autonomy.
- Continued use and adaptation: Teachers shared whether they continued using these tools post-pandemic and how they adapted them.
- Future perspectives: Participants reflected on the potential of CLIL and technology in education and their plans for future integration.

Ensuring consistency

To maintain consistency, the following measures were implemented:

- A standardized semi-structured interview protocol was used, ensuring all participants were asked about the same key themes while allowing flexibility for follow-up questions.
- Pilot interviews were carried out with two teachers who met the inclusion criteria, but were not part of the study sample, in order to refine the interview questions prior to full data collection.
- Individual interviews ensured more personal insights and reduced peer influence.
- Consistent administration and recording: All interviews were conducted by the same researchers, recorded, and transcribed verbatim for accuracy.
- Temporal consistency: All interviews were conducted within a specific timeframe.
- Mitigating recall bias: Since interviews were conducted two years after the COVID-19 online teaching experience, potential recall bias was a concern. To mitigate this, teachers were encouraged to reference teaching artifacts such as lesson plans, EdPuzzle activities, and student feedback that they had retained. Interview prompts included reminders of specific stages of online teaching, such as “think back to your first weeks transitioning to online learning” or “recall a specific lesson where you used EdPuzzle”. These strategies were aimed to help participants anchor their reflections in concrete experiences and reduced the risk of generalized or reconstructed memories.

Data analysis

To ensure rigor and transparency, structured thematic analysis was conducted using NVivo 12 (QSR International). Following Burns, et al's [38] framework, Open coding identified initial concepts, then Axial coding grouped related codes into broader categories, and finally Selective coding refined categories into themes. The coding framework was developed inductively, allowing themes to emerge naturally from the data. (Please refer to [Fig. 1](#): Coding process).

To enhance reliability, two independent researchers coded a subset of the data and resolved discrepancies through discussion. Additionally, member checking was conducted by sharing preliminary themes with participants to validate their accuracy and relevance.

Triangulation

Interviews from different teachers were triangulated to ensure a comprehensive understanding and verify the consistency of emerging themes. By adopting an inductive coding approach, validating themes through inter-coder reliability and member checking, and triangulating data sources, the study ensured a rigorous and transparent thematic analysis process.

Ethical considerations

Informed consent was secured from all participants, ensuring they understood the study's purpose and voluntary nature. Data were anonymized to protect participants' identities, and findings were reported in a manner that respected privacy thus aligning with GDPR principles.

Researcher's role and reflexivity

Given the qualitative nature of this study, the researchers played an active role in data collection, analysis, and interpretation. To mitigate potential biases and ensure methodological rigor, several strategies were adopted:

- Positionality and Reflexivity: The researchers' prior experience with CLIL and digital learning tools provided valuable context but also required a reflexive approach, as it is acknowledged that interpretations may be shaped by an awareness of CLIL's potential. To mitigate this, a reflexive journal was maintained to document

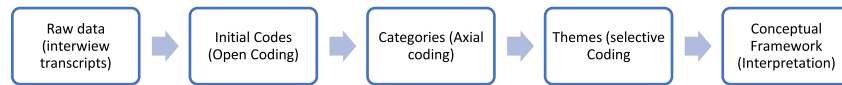


Fig. 1. Coding process.

preconceptions and ensure participant-driven analysis, to ensure that teacher voices, rather than researcher expectations, drove the analysis.

- Interview Neutrality: Open-ended, non-leading questions were used to allow participants to freely express their experiences. Probing techniques focused on clarification rather than steering responses.
- Triangulation and Validation: Data were analyzed independently by two coders, and discrepancies were resolved through discussion. Additionally, preliminary findings were shared with participants for validation.
- Ethical and Cultural Sensitivity: Given Albania's emphasis on teacher collaboration, efforts were made to ensure participants felt comfortable sharing both successes and challenges.

Ensuring replicability and trustworthiness

To enhance replicability, several additional methodological steps were employed. First, the study followed an interpretative phenomenological design, emphasizing teachers' lived experiences and the meanings they attributed to integrating CLIL and EdPuzzle. This design represents a key strength of this study, as it makes it possible to capture the depth and complexity of teachers' lived experiences—insights that would remain hidden in large-scale surveys or more superficial forms of data collection.

Participants were recruited purposively from a professional development network, with invitations sent to 40 teacher pairs, of which 22 consented to participate, and ultimately 15 were selected based on the above-mentioned criteria. Informed consent was obtained in writing.

Interviews were conducted in Albanian, audio-recorded, and transcribed verbatim by the research team. Transcripts were cross-checked by both researchers for accuracy. Data collection continued until thematic saturation was reached, which occurred when no new codes emerged after 12 pairs of interviews. To ensure saturation and strengthen the robustness of findings, three additional interviews were conducted, resulting in a total of 15 pairs of participants.

Thematic analysis was conducted using NVivo 12 (QSR International). The process involved open coding to capture initial concepts, axial coding to identify relationships among categories, and selective coding to refine themes. Both researchers independently coded a subset of transcripts, compared results, and resolved discrepancies to ensure reliability.

To establish trustworthiness, multiple strategies were employed: (a) member checking, by sharing emergent themes with participants for feedback; (b) triangulation across subject teachers and language teachers; (c) reflexive journaling to minimize researcher bias; and (d) maintaining an audit trail documenting decisions throughout data collection and analysis. These steps collectively enhance the study's transparency, credibility, and potential reproducibility.

Limitations

While this study provides valuable insights, several limitations must be acknowledged to contextualize its findings. (a) The research focused on a specific group of Albanian secondary school teachers who had prior exposure to CLIL professional development. While this focus enriches the depth of the study, it also constrains the generalizability of the results to broader populations. (b) The qualitative design, though well-suited for capturing the complexity of lived experiences, inevitably relies on researcher interpretation, and thus requires reflexivity to ensure transparency. (c) Moreover, Albania's unique educational and cultural

context may limit the direct transferability of findings to other settings, particularly given the disparities between urban and rural schools in terms of access to digital infrastructure and resources. (d) In addition, social desirability bias cannot be entirely excluded, as teachers may have emphasized successes while minimizing or omitting challenges. (e) A further limitation arises from the timing of the interviews, which were conducted two years after the pandemic. This temporal distance may have shaped participants' recollections, amplifying certain experiences while muting others.

Despite these constraints, the study contributes valuable insights into the ways in which CLIL and EdPuzzle can be integrated into practice, offering perspectives that inform both future research and the development of educational policy and practice.

Results

This section presents the findings from the in-depth interviews conducted with the 15 pairs of natural sciences subject teachers and English teachers involved in the study. The results are organized around the main themes identified during the thematic analysis: initial implementation of CLIL and EdPuzzle, perceived benefits and challenges, continued use and adaptation, and future perspectives. Each theme reflects the teachers' experiences, perceptions, and reflections on their use of CLIL and video-based tools in both online and subsequent teaching contexts (Table 2).

Initial implementation of CLIL and EdPuzzle

Theme: adaptation to online teaching

Teachers described the initial transition to online teaching during the COVID-19 pandemic as a challenging but ultimately rewarding experience. They highlighted the necessity of quickly adapting their teaching methods to maintain student engagement and ensure continuity of learning.

"I initially found it difficult to translate complex scientific concepts into a virtual format. However, the integration of CLIL allowed for a more structured approach where language and content were interwoven, making the material more accessible to students. The use of EdPuzzle,

Table 2
Synthesis of thematic analysis.

Key theme	Theme	Main concepts
Initial implementation of CLIL and EdPuzzle	Adaptation to online teaching	Challenging, Rewarding; Quick adaptation
Perceived benefits and challenges	Student engagement and learning	Enhanced engagement; Learning outcomes; Improved comprehension
	Challenges in implementation	Technological barriers; Balancing content and language
Continued use and adaptation post-online teaching	Sustained use of CLIL and EdPuzzle	Maintained student engagement
	Continued Use of CLIL	Ongoing benefits; Challenges in sustained use
	Potential for future application	Expanding CLIL and technology use; Professional development needs

with its interactive questioning features, was particularly beneficial in breaking down these concepts and providing immediate feedback. I felt that this was crucial for student comprehension." ST12,¹ 845–849²

"I viewed the shift as an opportunity to reinforce language skills through content that was inherently challenging. By collaborating closely with the physics teacher, together we were able to design lessons that not only focused on language acquisition but also on content understanding." ET7,³ 381–383

"The use of EdPuzzle enabled a more dynamic learning environment, where students could engage with the material at their own pace." ET1, 392

Perceived benefits and challenges

In addition to the primary findings, the study uncovered several challenges and opportunities associated with the collaborative implementation of CLIL and EdPuzzle in online natural sciences subject education. Teachers highlighted the need for ongoing professional development to effectively integrate these tools into their teaching practices. Despite these challenges, the study underscores the potential of CLIL and video integration to create a more inclusive and adaptable online learning environment.

Theme: impact on student engagement and learning

Teachers reported observing significant improvements in student engagement and learning outcomes as a result of implementing CLIL with EdPuzzle. The data analysis revealed that the collaborative efforts of natural sciences subject teachers and English teachers, using CLIL principles and video integration, positively influenced student engagement, comprehension, and autonomy. Teachers observed that the inclusion of real-world examples, language accessibility measures, and multimodal learning significantly enhanced student motivation and understanding. Moreover, EdPuzzle's interactive features promoted self-directed learning, empowering students to take ownership of their educational journey.

- Enhanced engagement: The teachers reported that the interactive nature of EdPuzzle, combined with the CLIL approach, significantly increased student participation.

"Students were more eager to engage with the material when it was presented in a way that integrated both subject content and language learning." ST11, 602

"The dual focus helped sustain students' interest throughout the lessons." ET9, 872

- Improved comprehension: According to the teachers, the integration of real-world examples and the accessibility of language provided by CLIL contributed to a deeper understanding of the subject matter.

"Students were better able to grasp complex scientific concepts when they were explained in simple language and reinforced through interactive video content." ST3, 320

Theme: challenges in implementation

While the teachers recognized the benefits of CLIL and EdPuzzle, they also faced challenges during implementation.

- Technological barriers: Teachers cited initial technological challenges, such as familiarizing themselves with the EdPuzzle platform and ensuring that students had reliable internet access.

"Some students struggled with the transition to online learning due to technical issues, which occasionally hindered their engagement." ST4, 1201

- Balancing content and language:

"It was challenging to balance the dual focus on content and language, particularly in an online environment where non-verbal cues were limited. Ensuring that students did not become overwhelmed by the language demands of the lessons required careful planning and constant adjustment." ET14, 1312

Continued use and adaptation post-online teaching

Theme: sustained use of CLIL and EdPuzzle

Following the return to in-person or hybrid teaching, teachers continued to use elements of CLIL and EdPuzzle in their instructional practices.

"The CLIL approach, when combined with interactive videos, remained effective in maintaining student engagement even after returning to the classroom. Although the frequency of using EdPuzzle decreased, I continued to incorporate it for specific lessons where complex concepts required additional reinforcement. I also adapted the CLIL approach to in-person settings by integrating more language-focused activities during class discussions." ST15, 1671

"I continued to use EdPuzzle, particularly for homework assignments and small group activities. I found that students appreciated the flexibility of engaging with video content outside of class time, which allowed for more interactive and discussion-based lessons during in-person sessions." ET12, 1921

"The CLIL methodology had become an integral part of my teaching practice, as it provided a structured way to integrate language learning into content-based instruction." ET6, 1889

Theme: teacher reflections on continued use

The teachers expressed positive reflections on the continued use of CLIL and EdPuzzle, emphasizing their effectiveness in both online and traditional classroom settings.

- Ongoing benefits: Teachers agreed that the continued use of CLIL and EdPuzzle helped sustain the benefits observed during online teaching, such as increased student autonomy and improved comprehension.

"I particularly valued the ability to tailor lessons to individual student needs." ST1, 697

"I appreciate the structured approach CLIL offers in reinforcing language skills alongside content learning." ET10, 1424

- Challenges in sustained use: However, the teachers also noted some challenges in sustaining these practices, particularly the additional time required for planning and the need for ongoing professional development to keep up with technological advancements.

"While I saw the value in using EdPuzzle, finding the time to create or curate high-quality video content was sometimes difficult." ET14, 1801

Theme: potential for future application

The teachers expressed optimism about the future potential of CLIL and video-based tools in education, seeing them as valuable resources for enhancing teaching and learning. The integration of CLIL and EdPuzzle had a significant impact on the teaching methodologies of both natural sciences and English educators. Teachers reported that merging content with language instruction enriched their teaching, creating a more engaging and holistic learning environment. The use of EdPuzzle for interactive questioning allowed educators to tailor their instruction

¹ ST = Subject teacher, followed by the number with which they were coded.

² Number of sentences during the interview

³ ET = English teacher, followed by the number with which they were coded.

to meet the diverse needs of their students, fostering a more personalized learning experience.

- Expanding CLIL and technology use: Teachers expressed a desire to expand their use of CLIL and EdPuzzle, particularly in exploring new ways to integrate these tools into other areas of the curriculum.

"I am particularly interested in how these methods could be adapted for interdisciplinary projects." ST15, 1877

"I see potential for using EdPuzzle in literature classes to create more engaging and interactive lessons." ET9, 46

- Professional development needs: The teachers also highlighted the need for ongoing professional development to fully harness the potential of CLIL and technology. They suggested that training in both the pedagogical aspects of CLIL and the technical aspects of using tools like EdPuzzle would be essential for educators looking to adopt these methods in the future.

Conceptual framework interpretation

This study proposes an original conceptual framework by bringing together bilingual pedagogy, digital tools, and collaborative teaching within the specific realities of Albanian secondary education (Fig. 2). While novel in its configuration and contextual application, the framework is strongly supported by existing literature. Research consistently shows that innovation emerges from the interplay of digital tool integration, teacher collaboration, and context-sensitive approaches such as CLIL [39–41]. The process dimension aligns with studies depicting innovation as a dynamic cycle of implementation, ongoing adaptation, and reflective practice [39–42]. Likewise, the outcomes reflected in the framework—student engagement, comprehension, autonomy, and sustainability—are well documented in prior CLIL and digital learning research [39,41,43,44]. Finally, the moderating conditions identified echo broader findings that sustained innovation depends on access to professional development, adequate digital infrastructure, and attention to contextual or methodological biases [40,43,45].

Thus, although original in its design and application, the framework is firmly anchored in established theoretical and empirical work, offering both conceptual novelty and scholarly coherence.

Discussion

The findings of this study offer valuable insights into the experiences of teachers in Albania who implemented CLIL combined with EdPuzzle in an online education setting. These insights are particularly significant

when considered within the broader Albanian educational context, where the integration of innovative teaching methodologies and technology has been gaining momentum, albeit with certain challenges.

Teachers' experiences and perceptions of using CLIL and video-based tools during online instruction

The Albanian educational context provides important insight into teachers' initial experiences with CLIL and EdPuzzle. Historically, Albanian classrooms have relied on more traditional, teacher-centered instruction, with limited integration of technology, particularly in public schools. The abrupt shift to online learning during COVID-19 acted as a catalyst, compelling teachers to explore new instructional approaches [46,47]. Within this context, the introduction of CLIL—still relatively new in Albania, especially in natural science subjects such as biology, physics, and chemistry—was perceived as both challenging and transformative.

Teachers described the structured nature of CLIL as supporting their ability to scaffold complex scientific concepts in a foreign language, while EdPuzzle's interactive features helped sustain student engagement in the online environment. These reflections resonate with international research indicating that CLIL promotes deeper cognitive processing and sustained engagement [2,20]. The experiences also align with constructivist perspectives emphasizing that knowledge is co-constructed through interaction and reflection [48,49]. Thus, teachers' perceptions support global findings that innovative bilingual and multimodal pedagogies can be effective even in challenging contexts where such methods are newly adopted.

Benefits and challenges of integrating CLIL and digital technologies

Consistent with broader CLIL and educational technology literature, teachers identified clear benefits from integrating CLIL with EdPuzzle: enhanced student engagement, improved comprehension of difficult concepts, and greater learner autonomy [27,29]. These outcomes mirror findings from other European contexts where CLIL has demonstrated the capacity to support deeper understanding and active learning [19,50].

However, teachers also highlighted substantial challenges. Many noted the significant time required to prepare CLIL-aligned lessons and interactive videos, alongside technological barriers such as uneven digital access and varying levels of digital literacy among students. These tensions reflect longstanding concerns in the literature about the feasibility of sustaining innovative practices when teachers carry heavy workloads or lack adequate digital resources [51,52]. In

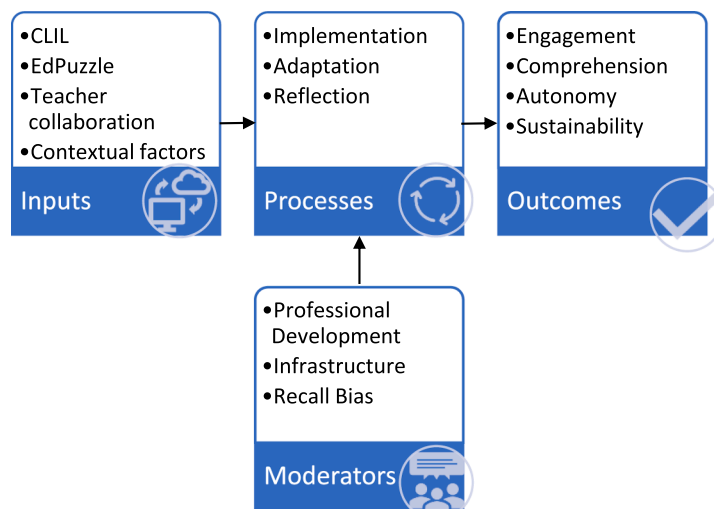


Fig. 2. Conceptual framework.

Albania—where professional development in technology-enhanced pedagogy has historically been limited—these challenges underscore systemic constraints that continue to shape teachers' ability to adopt new methods.

Continued use of CLIL and video-based tools after returning to in-person teaching

A notable finding is that teachers continued using CLIL and, to a lesser extent, EdPuzzle after returning to in-person or hybrid teaching. This demonstrates that the innovations adopted during the pandemic were not merely temporary responses but held lasting pedagogical value. Teachers reported using EdPuzzle for reinforcement, homework tasks, and differentiated instruction, while CLIL principles remained consistently embedded in their teaching practice. This persistence aligns with global post-pandemic trends where digital and bilingual strategies have become integrated into everyday instruction when teachers perceive tangible benefits [46].

In the Albanian context—where face-to-face instruction has traditionally been viewed as the primary mode of teaching—this sustained adoption marks a meaningful pedagogical shift. It also highlights the adaptability of CLIL and video-based tools across diverse instructional settings, from fully online to blended and in-person environments. Given the disparities in resources between urban and rural schools in Albania, such flexible approaches offer promising avenues for addressing diverse student needs.

Teachers' perspectives on the future potential of CLIL and video-based tools

Teachers expressed optimism about the continued use of CLIL and EdPuzzle, highlighting their potential to support interdisciplinary learning, strengthen student-centered pedagogy, and foster autonomy. These perspectives align with research showing that when digital tools are meaningfully integrated with pedagogical strategies, they can significantly enhance educational outcomes [27,29].

However, teachers emphasized that the long-term sustainability of these innovations depends on institutional support, improved digital infrastructure, and ongoing professional development. This echoes global recommendations that teacher capacity must be strengthened through continuous training, especially in rapidly evolving educational landscapes [23,53]. For Albania—a country striving to align its educational system with broader European standards [1]—investment in professional development and technology infrastructure will be critical. The findings suggest that CLIL and video-based tools could play a pivotal role in modernizing Albanian education, but only if supported by systemic, long-term initiatives.

Conclusion

This study investigated how 30 Albanian teachers implemented and experienced the integration of CLIL and EdPuzzle during the COVID-19 pandemic and in the transition back to in-person teaching. By adopting a phenomenological design and working with subject–language teacher pairs, the study generated rich, context-specific insights into how innovation unfolds in a traditionally conservative educational environment. The findings show that combining CLIL with interactive video-based tools supported meaningful pedagogical change, improving student engagement, comprehension, and autonomy—outcomes consistent with international CLIL and digital learning research.

Across the four research questions, a consistent pattern emerged. First, teachers' experiences revealed both enthusiasm and apprehension, as they navigated the dual challenges of online teaching and the introduction of bilingual pedagogy. Second, teachers identified clear benefits alongside practical constraints such as workload and limited technological infrastructure. Third, many educators continued using CLIL and

EdPuzzle after returning to the classroom, demonstrating that innovations adopted during crisis can become embedded when teachers perceive clear pedagogical value. Finally, teachers expressed optimism regarding the future potential of CLIL and EdPuzzle, while emphasizing that sustained use depends on systematic professional development, reliable digital infrastructure, and institutional support.

Taken together, these findings show that the long-term sustainability of innovative pedagogies hinges not only on teacher willingness but on the ecosystems in which they work. With adequate support, CLIL combined with digital tools can serve as a catalyst for modernizing Albanian education and aligning it more closely with European standards. Future research should continue to explore how these practices evolve across diverse Albanian contexts, and how policy, training, and resource investments can help ensure that the promise of innovation translates into equitable learning opportunities for all students.

While this study provides valuable insights, it is limited within a specific context. Future research could build on these findings by broadening both scope and methodology. Larger and more diverse samples, including teachers from different grade levels and both urban and rural schools, would provide a more comprehensive understanding of how CLIL and technology are adopted across varied contexts. Comparative studies across countries or regions could further illuminate how cultural and systemic differences shape implementation. In addition, mixed-methods designs or longitudinal approaches which are limited regarding the added value of CLIL [54] would enrich the evidence base by capturing not only perceptions but also measurable changes in student learning outcomes over time. Given the reliance on teacher recall in this study, future investigations might benefit from real-time or classroom-based observations to complement retrospective accounts. Finally, expanding beyond EdPuzzle to examine other digital tools would allow for a broader assessment of how technology can support CLIL and related pedagogical innovations. Such directions would strengthen the field by moving from context-specific insights toward more generalizable knowledge and practical guidelines for sustainable educational innovation.

Despite these limitations, the study's contributions are significant. Looking forward, the findings of this research demonstrate the transformative potential of CLIL and digital tools like EdPuzzle in the Albanian education system. By enhancing student engagement, comprehension, and autonomy, these innovative practices offer a pathway to more effective and inclusive education. As Albania continues to navigate the challenges and opportunities of the post-pandemic era, the sustained adoption and expansion of such methodologies could play a pivotal role in shaping the future of education in the country.

These recommendations aim to support the sustained and expanded use of CLIL and digital tools in Albanian education, ensuring that the innovative practices developed during the pandemic continue to benefit students and teachers in the long term. By aligning policy, practice, and research, Albania can create a more inclusive, engaging, and effective education system that prepares students for the challenges of the future.

Recommendations

Based on the findings of this study, several interconnected recommendations emerge to support the effective integration of CLIL and digital tools in Albanian education. These recommendations address institutional policy, teacher practice, research directions, and technological infrastructure—all essential components for sustainable innovation.

At the institutional level, the Albanian Ministry of Education should prioritize the institutionalization of CLIL and the use of digital tools like EdPuzzle within the national curriculum. This could involve creating specific guidelines and resources for teachers on how to effectively implement these methods in both online and traditional classroom settings. By embedding CLIL and digital tools into official educational frameworks, the Ministry can ensure consistent and widespread

adoption across schools in Albania.

To sustain and expand the use of CLIL and EdPuzzle, there is a critical need for continuous professional development programs for teachers. Regular Continuous Professional Development opportunities, such as workshops, and certification programs that focus on innovative pedagogical practices, technology integration, and bilingual education should be integrated to the ongoing professional development of teachers. These programs should be accessible to teachers across the country, including those in rural and underserved areas, to ensure equitable professional growth opportunities.

To facilitate the effective use of digital tools like EdPuzzle, it is essential to enhance the digital infrastructure in Albanian schools. This includes ensuring reliable internet access, providing adequate devices for both teachers and students, and offering technical support for the use of educational technology. Investments in digital infrastructure are particularly crucial in rural and underserved areas, where access to technology may be limited.

There is a need for the development of localized digital content that aligns with the Albanian curriculum and cultural context. Educational technology providers, in collaboration with the Ministry of Education, should work on creating digital resources, including video lessons, interactive quizzes, and bilingual materials that are tailored to the needs of Albanian students. Localized content would enhance the relevance and accessibility of digital tools for both teachers and students.

Teachers should be encouraged to explore and use Open Educational Resources (OER) that are freely available online. OER can complement CLIL and EdPuzzle by providing a wide range of high-quality, adaptable teaching materials that can be integrated into lessons. Training programs should include guidance on how to effectively search for, evaluate, and incorporate OER into classroom practices.

For classroom practitioners, the pathway forward involves establishing collaborative learning communities. These communities can serve as platforms for sharing experiences, best practices, and challenges, fostering a culture of continuous improvement and peer support. Schools and educational organizations should facilitate these communities by providing time, space, and resources for regular meetings and discussions.

For teachers new to CLIL and digital tools, a gradual approach to implementation is recommended. Educators should start by incorporating small-scale CLIL activities and digital resources into their lessons, gradually increasing their complexity and frequency as they become more comfortable with these methods. Experimentation with different tools and strategies is encouraged, allowing teachers to tailor their approach to the specific needs of their students and classroom contexts.

Teachers should establish mechanisms for receiving continuous feedback from students regarding their experiences with CLIL and digital tools. This feedback can be used to adapt and refine teaching strategies, ensuring that they remain responsive to student needs and preferences. Additionally, educators should regularly assess the effectiveness of these methods in improving student engagement, comprehension, and autonomy, making data-driven decisions to enhance their teaching practices.

Future research should expand beyond the scope of this study by including a larger and more diverse sample of teachers and schools, not only across Albania, but in other contexts as well. Comparative studies between urban and rural schools, as well as between different educational levels (e.g., primary, secondary, and tertiary education), would provide a more comprehensive understanding of the challenges and opportunities associated with CLIL and digital tool integration.

Longitudinal research is needed to examine the long-term impact of CLIL and digital tools like EdPuzzle on student outcomes. Such studies should track students' progress over multiple years, assessing the sustained effects on language proficiency, subject comprehension, and overall academic performance. This would provide valuable insights into the long-term benefits and potential limitations of these innovative teaching methods.

Further research should explore the scalability and adaptability of CLIL and digital tools in various educational settings, particularly in rural and low-resource environments. This research should investigate the barriers to implementation in these contexts and propose strategies for overcoming them. Understanding how to make these methods accessible and effective in diverse educational settings is crucial for ensuring that all students can benefit from innovative pedagogical practices.

Future studies should also focus on the impact of professional development programs on teachers' adoption and effectiveness of CLIL and digital tools. By examining the link between training and classroom practices, researchers can identify the most effective forms of professional development and provide recommendations for scaling these programs. Together, these interconnected recommendations offer a comprehensive framework for sustaining and expanding CLIL and digital tool integration in Albanian education and beyond.

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Approval of the submitted version of the manuscript

Please check this box to confirm that all co-authors have read and approved the version of the manuscript that is submitted. Signatures are not required.

CRediT authorship contribution statement

Gerda Sula: Writing – review & editing, Writing – original draft, Validation, Supervision, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Merita Hoxha:** Writing – review & editing, Supervision, Investigation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Interview Guide

The following semi-structured interview guide was used with each participant. Each interview lasted 45–60 min and was conducted in Albanian.

Theme 1 – Initial Implementation

1. Can you describe your first experiences with integrating CLIL and EdPuzzle during online teaching?
2. What were your initial challenges and successes?
3. How did you collaborate with your teaching partner (subject teacher / English teacher)?

Theme 2 – Perceived Benefits and Challenges

4. In what ways did using CLIL and EdPuzzle influence student engagement?
5. How did these tools affect students' comprehension and autonomy?
6. What challenges did you face in balancing content and language demands?
7. What technological barriers, if any, did you and your students encounter?

Theme 3 – Continued Use and Adaptation

8. Have you continued using CLIL or EdPuzzle after the return to in-person classes?

9. If yes, how have you adapted these practices to face-to-face teaching?

10. What aspects have been most sustainable in your current teaching practice?

Theme 4 – Future Perspectives

11. What future potential do you see for integrating CLIL and video-based tools in Albanian education?

12. What professional development or resources would help teachers use these methods more effectively?

13. If you were to recommend CLIL and EdPuzzle to another teacher, what advice would you give?

Instrument Development Note:

This guide was adapted from frameworks in CLIL and educational technology research [2,37], and piloted with two non-participating teachers for clarity. Minor revisions were made to sequencing and phrasing before final use.

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