Research Article

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Unleashing Student Motivation and Engagement Through Content and Language Integrated Learning and Video Integration in Physics Education – Insights from an Albanian Case Study

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Abstract

Content and Language Integrated Learning (CLIL) is an educational approach, merging language learning and subject content to bolster both students' language proficiency and academic understanding. This analysis explores the pivotal role of CLIL in elevating students' language skills, content knowledge, motivation, cognitive abilities, intercultural awareness, and multilingualism in an online setting. Amid the COVID-19 pandemic, a physics teacher in Albania sought ways to motivate her 11th-grade students isolated at home. Collaborating with their English teacher, the students translated, voiced over, or subtitled English physics videos and employed EdPuzzle (https://www.edpuzzle.com) for interactive questioning. The study employed a phenomenological design, delving into teachers' and students' feelings about this experience two years after. The study explored the impact of CLIL and video use on student motivation, comprehension, and engagement in physics education during online teaching. Findings revealed that CLIL and video integration enhanced motivation, content understanding, and student autonomy. Real-world examples and personalization kindled intrinsic motivation, while language accessibility and multimodal learning enriched comprehension. Findings also highlighted the long-term potential of CLIL and videos to transform physics education, promoting inclusivity, autonomy, and international collaboration.

Keywords: *CLIL (Content and Language Integrated Learning), Online Physics Education, Student Motivation, Video Integration, Albania*

1. Introduction

1.1 Physics education in Albania

Presently, physics education in the Albanian high school encounters challenges related to student motivation and engagement (Ersoy, 2016). Such challenges have been exacerbated by the COVID-19 pandemic. The shift to online learning necessitates innovative approaches to maintain educational quality. The need for effective strategies to bridge language and content gaps in physics education is crucial (Hoti, Dragusha, & Ndou, 2022; Suprapto, Rizki, & Cheng, 2024). Past initiatives in Albania have sought to improve physics education, but gaps persist (Ersoy, 2016). These efforts may have lacked a comprehensive integration of language and content, hindering students' overall learning experience. The current research aims to build upon and address these gaps.

Content and Language Integrated Learning (CLIL) is an educational approach that has gained significant attention in recent years. By integrating language learning and subject content, CLIL aims to enhance students' language proficiency while simultaneously supporting their understanding of various academic disciplines (Lyu, 2020; Navés, 2009).

CLIL has shown to support students' learning and the benefits it offers in terms of language development, content knowledge acquisition, motivation, cognitive skills, intercultural awareness, and multilingualism (Fontecha & Alonso, 2014). It provides students with authentic opportunities to engage with the target language in meaningful contexts, leading to improved language proficiency (Guida & Cinganotto, 2022). By using content-related materials and activities, students develop not only their language skills but also a deeper understanding of subject matter (Kambarova & Tussupbekova, 2020). Studies have shown that students in CLIL programs achieve comparable or even better results in subject-specific assessments compared to traditional content-based instruction (Fajardo Dack, Argudo, & Abad, 2020).

One of the key advantages of CLIL is its ability to enhance students' motivation and engagement. By integrating language learning with subject content, students perceive the relevance and authenticity of their studies, leading to increased enthusiasm for learning. CLIL programs often involve active and participatory learning experiences, allowing students to interact with content, collaborate with peers, and apply their knowledge in real-world contexts (Pinner, 2013). Moreover, the integration of technology in teaching and learning programs, has been shown to significantly enhance the efficiency of learning, providing students with more interactive, engaging and meaningful learning experiences (Simbolon et al., 2020; Turku, 2024).

Furthermore, CLIL promotes the development of cognitive skills. The integration of language and content challenges students to think critically, solve problems, and analyze information. These higher-order thinking skills contribute to students' overall academic development and their ability to apply knowledge across various domains (Campillo-Ferrer, Miralles-Martínez, & Sánchez-Ibáñez, 2020).

CLIL can encourage multilingualism by providing opportunities for students to learn and use multiple languages in their academic pursuits. CLIL programs provide students with the chance to learn and use multiple languages in their academic pursuits (Cenoz, Genesee, & Gorter, 2014). Rather than solely focusing on the target language, CLIL incorporates additional languages relevant to the subject content (McDougald & Pissarello, 2020).

Research indicates that the integration of CLIL into education systems presents several challenges, including teachers' conflicting beliefs about the approach, their individual preferences for either content or language instruction, and the inherent difficulty in maintaining a balanced emphasis on both content and language within CLIL classrooms (Villabona & Cenoz, 2021). Various countries have attempted to integrate CLIL into their educational systems with varying degrees of success. In Spain, for instance, CLIL has been widely adopted, but issues such as unequal access and variability in program quality persist (Pérez Cañado, 2018). Similarly, in Italy, CLIL has been implemented at the secondary level, though concerns remain about the adequacy of teacher

preparation and the consistency of outcomes (Lopriore, 2018). Despite these challenges, the growing body of research underscores the potential of CLIL to transform language and content education when supported by appropriate policies and teacher development programs (Dalton-Puffer, Hüttner, & Llinares, 2022).

1.2 COVID-19 and CLIL

After the COVID-19 pandemic, an outbreak of literature analysis examined the role of CLIL in supporting students' learning. Research has explored the benefits of CLIL in terms of engagement and motivation, language development, content acquisition, adaptability, and flexibility. In addition, some studies have explored the effects of CLIL on social and emotional support during challenging times.

Engagement and Motivation: The pandemic has created unique challenges for student engagement in remote learning (Garbarova et al., 2023; Jeganathan & Shanmugam, 2022). Vlasenko et al. (2020) show that CLIL encourages active participation, collaboration, and hands-on activities, fostering student engagement during these challenging times.

Language Development: CLIL offers a natural context for language acquisition as students engage with subject content. By using language-rich materials, discussions, and projects, CLIL supports the development of language skills, including vocabulary expansion, grammatical accuracy, and oral and written communication proficiency (Hemmi & Banegas, 2021).

Content Acquisition: CLIL allows students to continue acquiring subject-specific knowledge and skills despite the limitations of remote learning. By integrating language and content, CLIL helps students grasp complex concepts, make connections, and deepen their understanding of various academic disciplines (Fernández-Sanjurjo, Fernández-Costales, & Arias Blanco, 2019).

Adaptability: CLIL can be adapted to different remote learning environments and accommodate diverse student needs. It offers flexibility in terms of incorporating digital tools, multimedia resources, and online platforms to deliver CLIL instruction (Pérez-Milans, 2022). This adaptability of CLIL allows educators to cater to the specific requirements of remote and hybrid learning, ensuring continued support for students' learning during the pandemic.

Social and Emotional Support: CLIL, through its interactive and collaborative nature, can provide social and emotional support to students during these challenging times. Collaborative CLIL activities foster peer interaction, communication, and a sense of belonging within the virtual classroom (Meyer, Coyle, Imhof, & Connolly, 2018).

1.3 Research Questions

This study addresses the gap in our understanding of the dynamics of online physics education by investigating the multifaceted impact of CLIL principles, video development, and the integration of EdPuzzle on 11th-grade students' learning experiences. Exploring students' perceptions and experiences with CLIL and video materials contributes valuable insights into the effectiveness of these pedagogical tools, guiding educators in tailoring instructional strategies. Moreover, the study delves into the nuanced aspects of video content delivery, assessing the efficacy of translated, voice-overed, or subtitled videos in fostering comprehension and engagement among physics students.
In this study, the following research questions were explored:

(1) How did the incorporation of CLIL principles and video development impact student motivation to learn physics during the online teaching period?
(2) What were the perceptions and experiences of 11th-grade students regarding the use of CLIL and video materials in their physics learning?
(3) How effective were the translated, voice-overed, or subtitled videos in enhancing students' comprehension and engagement with the physics content?
(4) To what extent did the integration of EdPuzzle for interactive questioning in conjunction with video materials contribute to student participation and understanding?

2. Methods

2.1 Research Design

A phenomenological design was selected to explore the research questions. This is a qualitative approach, focusing on understanding and exploring individuals' lived experiences of a particular phenomenon. It aims to uncover the essence and meaning of those experiences as described by the participants themselves (Frechette et al., 2020). Applying a phenomenological design allowed the researcher to delve deeply into the subjective experiences of teachers and students. It aims to uncover the rich and nuanced meanings attributed to their experiences, providing valuable insights into their lived realities from two years ago. Data were collected two years after the project was finished.

2.2 Research context

This study seeks to contribute scientifically by investigating the specific case of Albanian physics education, providing insights that, are not only relevant to the local context but also, offer broader implications for the international educational community. Albania, as the backdrop for this case study, presents a unique environment in which it is possible to explore the dynamics of student motivation and engagement in physics learning. While CLIL and video integration have shown promise in enhancing language acquisition and engagement in various subjects, their application in physics education, particularly in Albania, remains under-explored. The cultural and educational nuances of the Albanian setting add a distinctive layer to the examination of Content and Language Integrated Learning (CLIL) principles and video integration in the physics curriculum. By focusing on this particular context, the study aims to bridge gaps in the existing literature, offering a more comprehensive understanding of the interplay between instructional strategies, technology tools, and linguistic considerations in enhancing students' learning experiences.

2.3 Case presentation

During the online teaching school year due to COVID-19 outbreak, for the teacher of physics at a high school in Albania, it was important to find ways to motivate her 11th grade students to continue their learning, even though they were isolated at home. There were a lot of high-quality videos directly related to the content that the students needed to cover, but they were in English. She assigned students in groups to translate, voice-overed or subtitled the selected videos. Then, through EdPuzzle, they developed close-ended and open-ended questions to the videos.

2.4 Content of Physics

The physics curriculum in the Albanian high school aims to contribute to the development of competencies that serve individuals on a personal, social, and economic level, and are related to local, national, and global issues. The aim of teaching and learning physics is to encourage and enable students to: a) develop basic knowledge and concepts for their scientific formation; b) discover the connections and dependencies between the living world and the environment; c) foster scientific skills, critical thinking, and creativity; d) raise awareness to collaborate responsibly with the environment for its conservation and protection, and e) use information and communication technology as a tool for securing and communicating information (ASCAP, 2023). The thematic blocks that the physics teacher focused on were the “Constant electric field” and the “Electric current.” Each of these blocks has specific competencies and it is broken down into several content topics.

2.5 Case Structure

Students were broken into groups of four. The groups were assigned by the teacher of Physics and the English Teacher, making sure that there were high-performing students, average ones and challenged ones in each group. Each group got the topic and the video assigned by the teacher of physics. She offered video tutorials on how to use EdPuzzle for the task at hand. Each group was in the driver's seat when their topic was being taught. Students collaborated with the English teacher for the correct translation, and with the physics teacher for the content-related vocabulary in Albanian. The concepts were covering the physics curriculum, and the English teacher used project hours specified in the program to work with groups of students.

2.5.1 Participants

Participants were students who attended the CLIL program during the COVID-19 pandemic, two years prior to the current research. At the time of this study, they were university students, and contact with them was facilitated through their former high school teachers.

The teacher of physics and the teacher of English, both teaching at the High School Petro Nini, Tirana, were identified during a professional development activity on CLIL, and they presented designing and implementing this CLIL project. They provided data and focal points for their students. Students were purposefully selected. Selection criteria included students' involvement in the subject area, grade level, and English level. Identified participants who could provide rich and detailed descriptions of their experiences were contacted. Out of 69 students participating in that teaching experience, 21 were selected. A snowballing technique was used to contact students, as they were distributed in different universities in Albania and abroad. Fifteen (15), 11 girls and 4 boys, agreed to participate and be interviewed at length. Age ranged from 19 to 21 years.

2.5.2 Data collection tool

In-depth, individual semi-structured interviews with the selected participants were conducted. Phenomenological interviews aim to elicit detailed descriptions of participants' experiences; therefore, open-ended questions were used to encourage participants to reflect on their experiences, emotions, perceptions, challenges, and meaningful moments from two years ago. Participants were encouraged to share freely their thoughts and memories.

Digital technology was utilized to conduct the interviews, with WhatsApp chosen as the most accessible platform. The interviews were video-recorded and subsequently transcribed for the sake of analysis. Interviews lasted 45 – 75 minutes.

2.5.3 Data Analysis

The collected data was analyzed using qualitative analysis techniques. Thematic analysis and narrative analysis were employed. Data to identify recurring themes, patterns, and key findings related to the experiences of teachers and students were coded while looking for similarities and differences among participants' narratives and perspectives.

Thematic analysis of the interviews was conducted according to Braun and Clarke's (2006) guidelines. The transcribed interviews were presented and analyzed as a full-body text to avoid fragmentation and allow the analysis of overlapping themes across different sections. Repeated parallel readings of the participants' responses were conducted. The procedure allowed familiarizing with the text before codes were generated. Codes were associated with themes representing core experiences as expressed by participants. The frequency of occurrence across cases guided the process of theme generation, while analytical decisions were made based on the relevance of answers to the research.

2.5.4 Trustworthiness

Once the essence description was distilled, it was shared with the participants to seek their feedback and validation. This member-checking process ensured that findings aligned with participants' experiences and interpretations. Participants' input into the final analysis was incorporated as appropriate.

2.5.5 Ethical Considerations

Ethical practices were ensured throughout the research process. Informed consent was obtained from participants. Participants were ensured of maintained confidentiality, and relevant ethical guidelines were followed throughout the whole process.

3. Results

The themes and subthemes identified by Ryan and Deci (2000) help to specify the social context factors that produce variability in internal motivation. These serve as a comprehensive framework for conducting the case study and provide valuable insights into the effectiveness and implications of the teacher's use of CLIL and video development in online physics teaching during the COVID-19 pandemic.

Table 1: Themes, subthemes, and corresponding keywords

Theme	Subtheme	Keywords
Student motivation	Engagement with content	Visual and auditory stimuli, Interaction; Personalization; Enhancing intrinsic motivation;
	Relevance and authenticity	Real-world applications; Contextual understanding; Personal connection with the content; Fostering curiosity; Building confidence
	Personalization and autonomy	Flexible and customized Learning; Increased engagement; Sense of responsibility
Student perceptions and experiences	Student feedback and attitudes	Sustained engagement and interest; Relevance; Autonomy; Inclusivity
	Learning preferences	Effectiveness in concept comprehension; Language development; Practical applications
	Language accessibility	Increased Comprehension for Challenged English Learning Students (ELL); Supporting ELLs in improving their English skills; Inclusive learning environment; Reinforcing concepts and terminology; Promoting active learning; encouraging Participation;
	Multimodal Learning	Dual encoding of information; Improved conceptual understanding; Real-Life applications; Engaging visuals; Support for diverse learning styles; Retention and recall
	Cognitive Load and Attention	Reduced cognitive load with familiar language; Audio-visual synchronization; Attention to linguistic elements
Interactive Questioning	Feedback and Learning	Immediate Feedback; self-assessment; Eencouraging reflective learning; Individualized learning journey; Enhanced student engagement
	Student Autonomy and Accountability	Self-paced learning; Adaptable learning environment; Personalized learning experience; Student agency and decision making; Student responsibility; Metacognitive awareness
Implications on students' learning beyond high school	Sustainable Education	Promoting self-directed learning; Enabling lifelong learning

3.1 Student Motivation

Student motivation is a crucial factor in effective learning (Szymkowiak, et al., 2021). In the context of the physics teacher's case study, the use of videos and CLIL strategies played a significant role in

shaping students' interest in physics topics and concepts during the online schooling period caused by the COVID-19 outbreak. Fourteen (14) out of 15 students mention concepts related to student motivation. Below, subthemes and concepts are analyzed and illustrated by student quotes.

3.2 Engagement with Content

This section explores ways how this approach affected students' engagement with content. The identified categories are as follows:

Visual and auditory stimuli: "Because the videos were so interesting, it was easy for me to understand the concept of interaction of forces." (S9[1], 498[2])

Interaction: "EdPuzzle was so cool! I could watch the video and then try to respond to the questions related to the videos." (S2, 782)

Personalization: "I like to stay awake late at night. So, I could watch the videos like at 2:00 AM and I could truthfully say I was learning. My parents had no right to complain then [laughs]" (S8, 222)

Enhancing Intrinsic Motivation: "It felt so good to know whether I was right or wrong right away. This way, I was much more motivated to learn the correct answer, rather than when I usually get the test assignment a week or so later." (S2, 299)

3.3 Relevance and authenticity

The incorporation of real-world examples and authentic materials in videos was reported to play a significant role in enhancing students' motivation to learn physics. This section examines how the use of these elements contributed to the sense of authenticity, ultimately influencing student motivation positively, as reported by both students and teachers. Understanding the real-life contexts in which physics principles operate helped instill a sense of purpose and meaning in their studies, making the learning experience more meaningful and enjoyable for the students. This curiosity-driven approach cultivated a sense of inquiry and the desire to learn more, resulting in higher levels of motivation to explore physics topics in depth. Categories identified under this subtheme, as experienced and reported by students, are illustrated as follows:

Real-world applications: "It was so interesting to see applications of what we were studying to the real world. Our school is so theoretical. These videos made me perceive physics as a relevant and essential discipline, which pushed me to engage more actively with the subject matter." (S11, 2089)

Contextual understanding: "The videos helped me grasp the "why" behind the concepts we were learning." (S9, 2072)

Personal connection: "Seeing how physics influences my immediate surroundings and personal interests created a personal connection with the subject matter. I am now studying medicine, and I performed really well in Physics in my first year. Theoretical physics is one of the most dreaded subjects for Medicine students." (S15, 5409)

Fostering curiosity: "The inclusion of real-world examples of intriguing phenomena or applications in videos sparked curiosity in me. Naturally, I wanted to explore further and seek explanations." (S11, 900)

Building confidence: "Watching the videos and solving tasks on the platform made me feel much more confident that I had understood the concept. It was such an exhilarating feeling. I had never felt that I could succeed in learning physics." (S2, 675)

[1] *Student with the number 9.*
[2] *Line 489 of the interview transcripts*

3.4 Personalization and Autonomy

This section examines how providing students with control over the pace and access to video materials influenced their motivation and sense of ownership in the learning process. The identified categories, as experienced by students and illustrated bellow, were:

Flexible and customized learning: "The freedom to review videos multiple times, pause, and rewind, catered to my learning pace and to my learning style." (S2 924) "I could spend more time on challenging topics or move quickly through familiar concepts, and nobody would have anything to say. In class, when I don't understand, I don't ask questions. I don't want to look dumb." (S14, 2033)

Increased engagement: "I don't think I have studied any other subject during the pandemic as much as I did physics. It is funny: being more in control made me spend more time and effort in the subject, not the other way around, as teachers might think." (S13, 846)

Sense of responsibility: "Because the teacher trusted us to work more independently, we felt more responsible to work harder." (S11, 989)

3.5 Student Perceptions and Experiences

3.5.1 Students' Feedback, and Attitudes

Understanding student perceptions and experiences is essential for evaluating the effectiveness of the physics teacher's approach using videos and CLIL during online teaching. This section delves into students' feedback, opinions, and attitudes toward the incorporation of videos and CLIL strategies in their physics learning. All 15 students had opinions and feedback on these issues. The identified categories, as illustrated below, were: sustained engagement and interest, relevance, autonomy, and inclusivity.

Sustained engagement and interest: "I still remember what my topic was, even two years later. This goes to show that such learning technique increased my interest in physics." (S10, 3308) "The dynamic video content and interactive CLIL activities were much more engaging than traditional instructional methods." (S1, 209)

Relevance: "I valued the relevance of videos to real-world applications. It allowed me to understand physics concepts in practical contexts and see the subject's importance beyond theoretical knowledge." (S15, 298-299)

Autonomy: "It was great to access video materials at my convenience, allowing me to revisit concepts, pause, or rewind as needed." (S7, 990)

Inclusivity: "I'm not very good at English. But working with the video in translating it helped me better understand the concept of velocity in physics." (S6, 908)

3.5.2 Learning Preferences

Exploring students' perceptions and experiences regarding their learning preferences is essential to understanding how CLIL compares to traditional methods in their physics education. This section delves into students' viewpoints on the effectiveness of CLIL as a learning tool and whether they preferred this approach over traditional instructional methods. The identified categories as experienced and reported by students were as follows:

Effectiveness in Concept Comprehension: "It looks like English has nothing to do with physics. But in my experience, because I could listen to the concept in English and then read it in subtitles in Albanian, it helped me understand physics better. Go figure." (S5, 988)

Language Development: "Working with the videos in translating and then voice-overing them not only helped me better learn physics but it also improved my English skills, particularly in terms of vocabulary, pronunciation, and academic language use." (S15, 3333)

Practical Applications: "The use of real-world examples in videos and the activities helped me

connect theoretical knowledge with real-life situations. This made physics more relevant and more fun in my view." (S4, 698-699)

3.5.3 *Language Accessibility*

Language accessibility is a critical aspect of effective physics instruction, especially in an online learning environment, and with varying language proficiency levels in students (Kasneci, et al., 2023). This section explores the impact of translating, voice-overing, or subtitling videos on students' comprehension and engagement with the physics content as reported by the students, with a particular focus on accommodating students with different language abilities.

Increased Comprehension for Challenged English Learning Students: "Working in translating video materials and incorporating voice-overs or subtitles significantly improved my comprehension. And I was not good at English." (S6, 898)

Supporting ELLs in improving their English skills: "The work we did in translating, voice-overing, or subtitling videos helped us not only learn physics but also English." (S11, 1092)

Inclusive Learning Environment: "We worked in small groups, and I felt at ease when working at the videos. I could ask my buddies if I didn't know something. I was not as stressed." (S2, 889-890)

Reinforcing Concepts and Terminology: "Subtitling or voice-overing videos helped me reinforce both physics concepts and English skills. Seeing and hearing physics terms in both languages aided memory retention and strengthened my familiarity with physics language." (S8, 298-299)

Promoting Active Learning: "Subtitling videos made me switch between reading, listening, and speaking in both English and Albanian about physics." (S7, 676)

Encouraging Participation: "I haven't been as active in any online class as in the physics class. I participated in class discussions, asked questions, and actively participated in assignments; due to the work they did in preparing their assigned videos." (S6, 438-439)

3.5.4 *Multimodal Learning*

Multimodal learning, which involves presenting information through multiple sensory channels, has been shown to be highly effective in enhancing students' understanding and engagement with academic content (De Souza, et al., 2021). Eight (8) students out of 15 mention some form of multimodal learning. This section explores how the combination of visual and auditory inputs in videos contributed to students' comprehension and engagement with the physics content.

Dual Encoding of Information: "I could watch and listen to the videos. This helped me much better than just listening to my teacher explain something." (S6, 489-490)

Improved Conceptual Understanding: "The videos, together with the explanations in English and Albanian helped me clarify abstract physics concepts." (S8, 498)

Real-Life Applications: "By seeing and hearing about how physics principles were implemented in real-world scenarios, I could better understand the significance of what I was learning and its applications beyond the classroom setting." (S4, 870)

Engaging Visuals: "Videos illustrated complex processes, phenomena, and experiments in a visually appealing manner, capturing our attention." (S9, 540) "The videos, complemented by auditory explanations, kept my interest alive." (S5, 956)

Support for Diverse Learning Styles: By combining both visual and auditory elements in videos, the diverse learning preferences of students were addressed, being visual, auditory or both, supporting their individual needs, and learning strengths. "I perform much better if I see some concept being experimented than hearing about it. So, the videos improved my learning a lot!" (S11, 871) "I am a reader. I need to read to remember it better. The videos that had subtitles were much more efficient for my learning than those that were dubbed." (S.12, 309)

Retention and Recall: "The combination of visual and auditory inputs helped me better recall physics content." (S2, 498) "During the preparation for the physics exam for the state Matura, even

one year later, I could recall visual elements seen in videos and auditory explanations heard during the video viewing, reinforcing the memory of the material." (S15, 649-650) This enhanced retention supported long-term learning outcomes.

3.5.5 Cognitive Load and Attention

Cognitive load refers to the mental effort required for learners to process and understand new information (Sweller, 2020). The use of different language modalities in videos, such as translating, voice-overing, or subtitling, has been shown to impact students' cognitive load and attention during the learning process. Nine (9) out of 15 mention concepts indicating cognitive load and attention. This section explores how these language modalities influenced students' cognitive load and attention in the context of physics instruction.

Reduced Cognitive Load with Familiar Language: Videos presented in Albanian reduced students' cognitive load. "It was easier to work with videos in Albanian. I could focus more on comprehending the physics content." (S2, 598-599)

Audio-Visual Synchronization: "It was easy to follow when the voice-over in videos closely matched the visual content." (S7, 546) Should the audio and visuals be misaligned, it could lead to cognitive dissonance, which might disrupt the attention of the more challenged students.

Attention to Linguistic Elements: "Voice-overing or translating videos helped me focus on language nuances, improving my vocabulary and articulation." (S4, 597)

4. Interactive Questioning

The integration of interactive questioning tools through EdPuzzle in the physics teacher's instructional approach using videos and CLIL transformed passive video viewing into an engaging and interactive learning experience. This section discusses how the implementation of EdPuzzle facilitated active student participation and enhanced engagement with video content through interactive questions.

4.1 Feedback and Learning

EdPuzzle offered a platform for students to embed questions and interactive elements directly into videos. By pausing the video at strategic points and posing questions related to the content, students could actively engage with the material. This active learning approach seems to have motivated students think critically, analyze information, and respond thoughtfully, promoting a deeper understanding of physics concepts. Twelve (12) out of 15 students reported the added value of immediate feedback in promoting metacognition and enabling students to become more aware of their learning process and develop a deeper grasp of physics concepts.

Immediate Feedback and Self-Assessment: One of the key benefits of EdPuzzle reported was the provision of immediate feedback to students. "I had to respond to questions for each video and I got instant feedback on my answers. Thus, it was simple for me to check my understanding of the content in real-time. I could then re-watch the section of the video that I hadn't understood at first." (S2, 926-929)

Encouraging Reflective Learning: "I could pause the video to check my answers. Sometimes I reviewed specific parts of the content before responding to questions." (S4, 547-548)

Individualized Learning Journey: "I could review or re-watch segments of the video as many times as I wanted, before or after responding to questions. I could watch the video at double speed and slow down at the parts that I needed more help. It was so easy to learn in my own terms, not in teachers' terms." (S4, 492-494).

Enhanced Student Engagement: "I watched the videos beforehand because I wanted to be prepared when my peers would launch the quiz on EdPuzzle during the online class. I studied

because I chose to, not because I had to." (S5, 568-569)

4.2 Student Autonomy and Accountability

The integration of interactive questioning features in EdPuzzle shows to have offered students a dynamic and engaging learning experience, fostering their autonomy and accountability in the physics learning process. This section discusses how the use of interactive features in EdPuzzle promoted student autonomy in their learning and encouraged them to take ownership of their progress.

Self-Paced Learning: "I could watch it at double speed, I could pause, rewind, or re-watch segments of the videos. It was all me deciding." (S7, 772-773)

Adaptable Learning Environment: "With EdPuzzle, I could access the content anywhere, as long as there was internet access. I went to my grandmother's in [another city] and it was just fine." (S3, 333-334)

Personalized Learning Experience: "It was so simple to identify areas of strength and areas that required further attention from my part." (S15, 1103)

Student Agency and Decision Making: "It was me who decided when and how to engage with the video content and questions. I felt owner of my learning." (S11, 625-626)

Student Responsibility: "EdPuzzle helped me to take responsibility for understanding." (S9, 1281)

Metacognitive Awareness: "I knew when to double-speed, or when to pause when I wanted to consider my answers and review content. It helped me adapt my learning strategies and monitor my progress. (S 14, 659-660)

5. Implications on Students' Learning Beyond High School

While the COVID-19 pandemic forced educators to adapt rapidly to online teaching, the integration of CLIL principles and video development in physics education has proven to have far-reaching implications beyond crises. This section discusses the potential of CLIL and video development to contribute to improved learning in the long term, according to the students interviewed. Seven (7) out of 15 mentioned that such an experience had lasting effects on their learning styles.

5.1 Sustainable Education

Two were the identified categories under this subtheme as experienced and reported by students.

Promoting Self-Directed Learning: "EdPuzzle helped me learn how to be autonomous and accountable for my learning, which has been very important in my university studies. No other experience had taught me that, and it's a very important skill to have." (S15, 1254-1255)

Enabling Lifelong Learning: "I developed skills that extended beyond physics, such as how to seek out information independently, stay curious, and keep up with the latest developments even after two years later. (S5, 1388)

6. Discussions

The integration of videos and CLIL strategies in online physics education proved to be an effective approach for enhancing student motivation. By engaging students with dynamic visuals, real-world videos, interactive assessments, and opportunities for autonomy in learning, the teacher was able to cultivate a positive learning environment that stimulated interest and enthusiasm for physics topics and concepts.

The findings of the study underscore the importance of using innovative and student-centered approaches to promote motivation in online learning contexts and provide valuable insights for educators seeking to optimize engagement with subject matter in similar settings. As posited by Hoti

et al. (2022), it is imperative to prioritize efficacious strategies aimed at bridging linguistic and substantive disparities in physics education.

The results of the study showed that CLIL was an efficacious strategy to bridge linguistic and practical inequalities in physics education The integration of real-world examples and authentic materials in videos for physics instruction proved to be a powerful strategy for enhancing student motivation. CLIL programs frequently encompass dynamic and participatory learning experiences, allowing students to engage with content actively, collaborate with peers, and apply their knowledge within real-world contexts (Pinner, 2013). Overall, students' preferences for CLIL or traditional methods underscore the significance of creating meaningful and engaging learning environments that align with students' needs and preferences.

By grounding the subject in relevant and meaningful contexts, students developed a deeper appreciation for physics and its applications. The sense of relevance and authenticity nurtured students' intrinsic motivation, as they perceived physics as a valuable and essential discipline that connects with their lives and the world around them. The use of authentic materials and real-world examples holds promise for educators seeking to optimize student motivation and engagement in physics learning, both in online and traditional classroom settings.

As Cenoz et al. (2014) have unearthed CLIL programs provide students the opportunity to acquire and apply proficiency in multiple languages throughout their academic endeavors. The incorporation of personalization and autonomy using video materials had a significant impact on students' motivation and ownership of their learning. By granting students control over the pace and access to content, the teacher created a learning environment that respected individual differences and catered to diverse learning needs. Students' sense of ownership over their learning journey was nurtured as they became more self-directed, engaged, and responsible for their academic progress. Personalized learning experiences and autonomy emerged as powerful tools in promoting intrinsic motivation and fostering a deep passion for physics among students during online teaching. Educators seeking to enhance student motivation and engagement can draw valuable insights from this approach to empower learners in both virtual and traditional classroom settings. In the same line with these results, Vlasenko et al. (2020) demonstrate that CLIL promotes active participation, collaboration, and hands-on activities, thereby cultivating student engagement amidst these challenging circumstances.

Students' perceptions and experiences with CLIL as an effective learning approach compared to traditional methods provide valuable insights into the impact of the instructional approach.

Positive feedback on CLIL's effectiveness in concept comprehension, relevance to language development, interest and engagement, practical applications, and autonomy suggests that CLIL was well-received by students. Feedback on challenges can guide educators in addressing potential barriers to optimize students' learning experiences. Considerations should be given to students' access to technology, language proficiency levels, and individual learning needs to ensure equitable opportunities for all.

Language accessibility, achieved through translating, voice-overing, or subtitling videos, played a vital role in enhancing students' comprehension and engagement with physics content, and in improving their English proficiency, particularly for those with varying language proficiency levels. Positive feedback on these accessibility measures highlights their impact in supporting challenged English Language Learners (ELL) and creating an inclusive and supportive learning environment. By providing physics materials in multiple languages, educators can break down language barriers, nurture student confidence, and empower learners to fully engage with and comprehend physics concepts. The incorporation of language accessibility initiatives aligns with the goal of optimizing students' learning experiences and promote a deeper passion for physics among diverse learners. Furthermore, Hemmi and Banegas (2021) have ascertained that through the utilization of language-rich materials, discussions, and projects, CLIL substantiates the enhancement of language skills. This encompasses the expansion of vocabulary, grammatical accuracy, and proficiency in both oral and written communication.

The combination of visual and auditory inputs in videos played a significant role in enhancing students' comprehension and engagement with the physics content during online teaching. The multimodal learning approach capitalized on students' cognitive processes, providing dual encoding of information, and fostering a deeper understanding of physics concepts. By leveraging multimodal learning techniques through videos, educators can optimize students' understanding and retention of academic content, leading to more effective and meaningful physics education. The use of different language modalities in videos influenced students' cognitive load and attention during physics learning. When presented in students' native language, videos reduced cognitive load, supporting better comprehension and engagement. However, for students learning physics in a second language, subtitles or voice-overs may introduce additional cognitive challenges. To optimize cognitive load and attention, teachers should carefully design videos to align audio-visual elements, consider linguistic clarity, and account for individual differences in language proficiency and learning preferences. By carefully managing cognitive load and attention through language modalities, educators can create effective and inclusive physics learning experiences for all students.

The integration of EdPuzzle has proven to be a valuable tool, fostering deeper comprehension, enhancing engagement, and supporting personalized learning, thus creating meaningful and dynamic physics learning experiences. The use of EdPuzzle exemplifies how technology can be harnessed to optimize students' learning outcomes and nurture a passion for physics among learners.

Interactive questioning facilitated student autonomy and accountability in the physics learning process. The self-paced learning environment, flexibility in accessing content, and personalized learning experiences encouraged student agency, fostering decision-making skills and metacognitive awareness. Moreover, the immediate feedback on their responses promoted student accountability for their progress, as they actively sought to enhance their understanding of physics concepts.

The adoption of CLIL principles and video development in physics education goes beyond addressing the challenges posed by the COVID-19 pandemic. These approaches have the potential to contribute to sustainable and effective physics education in the long term. By enhancing accessibility and inclusivity, promoting self-directed learning, enabling lifelong learning, and fostering international collaboration, CLIL and video-based teaching methods prepare students to thrive in a globalized and rapidly changing world. Additionally, the integration of emerging technologies and the investment in teacher professional development ensure that physics education remains innovative and adaptive to the needs of future generations. Overall, sustainable physics education that leverages CLIL and video development lays the foundation for nurturing informed and engaged citizens who can contribute meaningfully to society and scientific advancements.

The integration of CLIL principles and video materials in physics education has transformative implications for flexibility and inclusivity. Pérez-Milans (2022) has determined that CLIL provides flexibility in integrating digital tools, multimedia resources, and online platforms for instructional delivery. By offering personalized learning paths, language support for ELL students, and accessible materials for diverse learning needs, CLIL and video-based teaching methods create an inclusive and responsive learning environment. Bridging cultural and linguistic gaps, accommodating different learning paces, and engaging visual and auditory learners contribute to improved student outcomes and a more dynamic and equitable physics education. Moreover, the flexibility of these methods allows educators to adapt to various learning environments, ensuring that physics education remains accessible and effective regardless of external circumstances. Overall, the integration of CLIL and video materials underscores the commitment to nurturing every learner's potential, promoting a love for physics, and empowering students to become lifelong learners. In the same line with the results of this case study, Fontecha and Alonso (2014) have unearthed that CLIL substantiates support for students' learning, yielding advantages in language development, acquisition of content knowledge, motivation, cognitive skills and intercultural awareness.

7. Conclusions

The integration of Content and Language Integrated Learning (CLIL) principles combined with video materials in teaching physics online to high schoolers in Albania has yielded profound and transformative outcomes. In this comprehensive case study, drawn from the perspectives of 15 students immersed in this innovative pedagogical approach, several salient conclusions emerge, shedding light on pivotal dimensions of the learning experience.

7.1 Enhanced Student Motivation

The infusion of dynamic visuals, real-world applications, and interactive assessments within the framework of videos and CLIL strategies has played a pivotal role in elevating student motivation. By cultivating relevance, authenticity, and personal connections with physics concepts, students reported a sustained interest, heightened curiosity, and enhanced confidence in navigating the intricacies of their learning journey.

7.2 Promotion of Autonomy and Accountability

The adoption of interactive questioning tools, exemplified by the EdPuzzle platform, has empowered students to actively participate in the learning process. Immediate feedback, self-assessment features, and a flexible learning environment have not only deepened their comprehension of physics concepts but have also instilled a culture of reflective learning. Students, equipped with the ability to make decisions aligned with their unique needs, preferences, and learning pace, assumed ownership of their educational journey.

7.3 Language Accessibility and Inclusivity

A critical facet of this pedagogical approach lies in the incorporation of language accessibility measures, including translation, voice-over, and subtitling of videos. This proved instrumental in fostering an inclusive learning environment, particularly benefiting English Language Learners (ELL). These measures facilitated comprehension, language proficiency improvement, and active participation, effectively dismantling language barriers.

7.4 Multimodal Learning for Enhanced Comprehension

The synergy of visual and auditory inputs within videos emerged as a linchpin in addressing diverse learning styles. The multimodal learning approach, characterized by dual encoding of information, significantly improved conceptual understanding, engaged students with real-life applications, and bolstered retention and recall. This adaptable approach catered to individual preferences, ensuring a more effective and meaningful physics education.

7.5 Positive Implications for the ongoing learning of the students

Far surpassing the immediate challenges posed by the pandemic, the integration of CLIL principles and video development exhibited enduring effects on students' learning styles. The cultivation of skills such as self-directed learning, curiosity, and autonomous information-seeking emerged as invaluable assets, not merely for current academic pursuits but as foundational pillars for a mindset of lifelong learning.

7.6 Sustainable Science Education

This study underscores the latent potential of CLIL and video-based teaching methods in contributing to a sustainable and effective physics education paradigm. Furthermore, consistent with the increasing body of evidence supporting the advantages of CLIL, this approach can be extended to other educational contexts, particularly within science education. By fostering self-directed learning, enabling a culture of lifelong learning, and encouraging international collaboration, these approaches equip students to thrive in an increasingly globalized world. The inherent flexibility and inclusivity of these methods ensure accessibility and efficacy, irrespective of external circumstances.

To conclude, the amalgamation of CLIL principles and video materials in online physics education emerges as a dynamic, student-centric approach with implications extending far beyond immediate challenges. This study provides nuanced insights for educators seeking to optimize engagement and motivation in both online and traditional classroom settings, charting a course for a resilient, inclusive, and innovative physics education landscape.

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