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Exploring the Use of Content and Language Integrated Learning and Construal in a Selected High School Class in Kurdistan Region

Zana Mahmood Hassan[1] **Raman Qalandar Hussien[2]** **Soma Nawzad Abubakr[3]**

[1, 2, 3] College of Languages, University of Sulaimani – Sulaymaniyah **- Iraq**

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Correspondence:
Raman Qalandar Hussien
Raman.hussien@univsul.edu.iq

Abstract

This study explores the possibility of integrating Content and Language Integrated Learning (CLIL) and Cognitive Grammar (CG) insights, particularly Construal, into a high school Biology class. It examines whether Biology teachers in high school can implement CLIL and CG principles in their teaching and assesses the influence of language proficiency on students' ability to accurately apply cognitive construals of action verbs and spatial prepositions. The research employs a mixed-method approach, combining diagnostic testing with classroom observations. Diagnostic tests assess eleventh-grade students' comprehension of specific linguistic elements, particularly how well students at B2 and C1 proficiency levels can identify and apply correct construals in a biological context. Observations focus on the teacher's integration of content and language, the effectiveness of language activities, and overall student engagement and instructional delivery. The findings aim to demonstrate whether explicit instruction on the construals of lexical items enhances students' understanding of biology content and their language skills, suggesting that a dual focus on

language and content can enrich learning without requiring extensive additional classroom time. This paper argues that integrating CG insights into CLIL methodologies can deepen students' conceptual understanding and improve their academic performance in a second language context.

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استكشاف استعمال التعلم القائم على التكامل بين المحتوى واللغة والتعلم التصويري للغة في صف مختار من المدارس الثانوية في إقليم كوردستان

زانا محمود حسن[١] رامان قلندر حسين[٢] سوما نوزاد ابوبكر[٣]

[١، ٢، ٣] كلية اللغات، جامعة السليمانية – السليمانية ، العراق

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رامان قلندر حسين

Raman.hussien@univsul.edu.iq

الملخص

تستكشف هذه الدراسة احتماليات التعلم القائم على التكامل بين المحتوى واللغة والنحو العرفني وخاصة التعلم التصويري في صف علم الاحياء للدراسة الثانوية. فهو يقوم بفحص ما اذا قام مدرس الاحياء بتطبيق مبادئ التعلم القائم على التكامل بين المحتوى واللغة والنحو العرفني اثناء التعليم. كما ويقيم تأثير الكفاءة اللغوية على قدرة الطلاب على تطبيق التفسيرات العرفنية لأفعال الفعل وحروف الجر المكانية بدقة، فأن البحث يستخدم نهجاً مختلط الأساليب من خلال دمج الاختبار التشخيصي لمستوى الطلاب والملاحظات الصفية. ويقوم الاختبار التشخصي بتقييم فهم طلاب الصف الحادي عشر لعناصر لغوية محددة ، خصوصاً الذين يكون مستواهم اللغوي من درجة B2 و C1 وقدرتهم على تحديد وتطبيق التفسيرات التصويرية الصحيحة في سياق علم الاحياء. وتركز الملاحظات الصفية فيما اذا قام المعلم بدمج المحتوى التصويري مع اللغة بالإضافة الى فعالية الأنشطة اللغوية ومشاركة الطلاب بشكل عام وايصال التعليمات للطلاب. تهدف النتائج إلى إثبات ما إذا كانت التعليمات واضحة حول التفسيرات التصويرية للغة تعزز فهم الطلاب لمحتوى علم الأحياء ومهاراتهم اللغوية ، مما يشير إلى أن التركيز المزدوج على اللغة والمحتوى يمكن أن يثري التعلم دون الحاجة إلى وقت إضافي مكثف في الفصل الدراسي. يجادل هذا البحث امكانية دمج رؤى النحو العرفني في منهجيات التعليم القائم على التكامل بين المحتوى واللغة وامكانيته على تعزيز فهم المبادئ للطلاب ويحسن أدائهم الأكاديمي في سياق لغة ثانية.

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1. Introduction

The focus of this paper is on integrating CLIL and CG insights, specifically Langacker's Construal, into teaching Biology at a private high school. CLIL promotes the simultaneous learning of subject content and a foreign language, focusing extensively on both elements. Coyle, Hood, and Marsh (2010) emphasis on the four Cs—communication, content, cognition, and culture—alongside the language triptych, aligns seamlessly with the incorporation of CG insights, particularly construal, into a biology classroom setting.

Langacker (1987; 1991) posits that typical scene settings involve a perspective where the speaker views the action from a distance. However, humans can also conceptualize themselves as participants within the scene. Shifting from an observer to a participant perspective induces significant changes in viewpoint, influencing the observer's interpretation and subsequently affecting language use. This perspective shift is crucial in teaching because understanding different construals of linguistic units can deepen students' grasp of the subject matter. By exploring various construals, students learn to avoid synonymous uses of lexical items and choose situation-appropriate language, akin to native speakers (Achard, 2008). Littlemore (2023) further argues that explicitly presenting different construal patterns and discussing their conventions can significantly enhance second language (L2) learners' development.

To explore these theoretical claims, a diagnostic test was administered to students at B2 and C1 levels to assess their ability to correctly apply construals in a biological context, with a specific focus on the usage of selected spatial prepositions and action verbs. This paper advocates for the integration of the CLIL approach and construal theory, proposing that explicit explanations of lexical items' meanings and contexts facilitate a dual focus on content and language without excessive time expenditure. This strategy not only enhances language comprehension but also enriches students' learning experience by deepening their conceptual understanding of biology.

2. Theoretical Background

2.1. Content and Language Integrated Learning (CLIL)

CLIL was introduced by European language experts in the 1990s, during a time when multilingualism and language education became significant issues in the European educational landscape (Gabillon, 2022).

CLIL is an educational approach that combines language learning with subject matter instruction. March (2002) adds that CLIL is a broad term that includes any activity where a foreign language is used as a medium for learning a non-language subject, with both language and the subject playing an integrated role in the curriculum. Thus, CLIL is a dual-focused approach that simultaneously considers both language and content. This led Ball (2006) to recognize the dual focus and assert that CLIL enables learners to acquire content though a language that is not their first. As a result, this method also involves learning the language itself, since the elements like grammar, vocabulary, and the language use are inherently integrated into the subject matter being taught. Hence, CLIL is any instructional approach that integrates both the teaching and learning of content and language (Dalton-Puffer, Llinares, Lorenzo, & Nikula, 2014; Llinares, 2015).

2.2. The primary goals of applying CLIL

Studies have shown that integrated learning significantly enhances the acquisition of a foreign language, with CLIL students demonstrating greater proficiency compared to non-CLIL students. Additionally, CLIL learners even outperform students who are one to three years ahead of them in non-CLIL program (Admiral, Westhoff, & de Bot, 2006; Alonso, Grisaleña, & Campo, 2008; Jiménez Catalán & Ruiz de Zarobe, 2009; Loranc-Paszylk, 2009; Lorenzo, Casal, & Moore, 2009; Lorenzo, 2010).

The positive results of learning a foreign language through CLIL programs are due to the increased and higher quality exposure to the language. CLIL facilitates more naturalistic learning compared to traditional English as a Foreign Language (EFL) lessons as it mirrors the conditions infants encounter when learning their first language (Mehisto, Marsh, & Frigols, 2008). Focusing on content offers a specific objective for language use (Dalton-Puffer, 2007), reducing stress (Jiménez Catalán & Ruiz de Zarobe, 2009), and establishing a more encouraging and interactive learning atmosphere.

Research suggests that teaching subjects in a foreign language does not hinder content acquisition (de Jabrun, 1997; Housen, 2002; Jäppinen, 2005; Van de Craen, Ceuleers, Lochtman, Allain, & Mondt, 2007; Seikkula-Leino, 2007; Badertscher & Bieri, 2009). In fact, evidence indicates that content learning can be more effective in CLIL settings (Bergroth, 2006; Grisaleña, Alonso, & Campo, 2009).

The findings indicate that learning content in a foreign language can enhance the performance of CLIL students (de Jabrun, 1997). Overcoming language challenges can result in increased mental activity, leading to a better grasp of curricular concepts (Dalton-Puffer, 2007). Key aspects of CLIL methodology include mental construction, scaffolding, the development of both lower and higher-order thinking skills (LOTS and HOTS), student-centered learning, and consideration of diversity and multiple intelligences. As a result, cognition is one of the four essential components of CLIL, along with communication, content, and culture, as detailed in the 4C framework (Coyle, Hood, & Marsh, 2010).

The combination of communication, content, cognition, and culture in the CLIL classroom, along with its enriching approach, creates connections that can help explain the potential of an integrated curriculum to boost motivation (Coyle, 2006), foster creativity (Baetens Beardmore, 2008), develop emotional competence (Nieto Moreno de Diezmas, 2012), promote social inclusion, equality, gender balance, and school progress (Marsh, 2002). Moreover, it can have a positive impact on both episodic and semantic memory and, in the long run, contribute to preventing dementia symptoms (Bialystock, Craik, & Freeman, 2007).

2.3. Cognitive Grammar (CG)

Cognitive Grammar (CG) is a fundamental aspect of the broader field of Cognitive Linguistics, which was extensively developed by Ronald Langacker (1987; 1991; 1999; Cognitive grammar: A basic introduction, 2008). CG proposes that language primarily functions as a symbolic system where forms, such as words and structures, are inherently connected to their meanings. According to this perspective, each linguistic expression, from simple words to complex structures, embodies a direct relationship between its physical form and the conceptual or semantic content it represents. Langacker (1987; 1991; 1999) emphasizes that grammatical constructions, recurring patterns of linguistic units, are foundational elements of language, highlighting a deep interrelation between form and meaning.

One of CG's main tenets is emphasizing meaning as essential to language comprehension. This focus on meaning is essential to language learning, particularly when comprehending how new words fit into a language and revealing the semantic complexity of grammatical constructs. Meaning is created by a dynamic process in which different conceptual activities are prompted by language factors (Hamawand,

2021). Effective language pedagogical strategies are provided by CG insights, which support instructional approaches that highlight the relationships between grammatical forms and their lexical roots. By pushing students to investigate the semantic underpinnings of language and consider the unique "semantic spin" that each language gives to its phrases, this method improves learning (Tyler & Evans, 2004; Tyler, 2012; Langacker, 2013). Langacker claims that comprehending this semantic dimension is more pleasurable and natural than rote memorizing (Tyler & Huang, 2018) By allowing students to explore the deeper meanings of grammatical objects, it promotes a more perceptive and intuitive interaction with the language.

Another fundamental tenet of CG is the fact that linguistic meaning and cognitive processes have their roots in physical events rather than just the mind. The development of embodiment in cognitive linguistics has been greatly aided by Lakoff and Johnson (1980), Johnson (1987), and Langacker (1987)), who have shown how language develops from and expands on people's bodily experiences with the outside world. They talk about how human interactions with the environment have a direct impact on fundamental ideas like metaphors, picture schemas, and categorization. The structural foundation for human cognitive processes and linguistic expressions is provided by these interactions, demonstrating the critical role that physiological experiences play in influencing how human perceive and utilize language (Rohrer, 2007; Hamawand, 2016; Evans, 2019; Wen & Jiang, 2021).

For language instruction to be effective, this embodied foundation of cognition is essential. Teachers can create instructional strategies that more thoroughly connect with students' intuitive understanding of the universe by recognizing the part that physiological sensations play in cognitive processes. According to Llopis-Garcia (2024), teaching linguistic unit conceptualization explicitly fosters long-term retention, decreases reliance on rote memorization, and results in a deeper grasp of concepts. Because it encourages a more integrated engagement with both subject and language, this method also improves learners' capacity to accurately explain how linguistic units are construed.

This viewpoint suggests significant ramifications for language instruction and learning by moving the traditional emphasis from form alone to a more integrated understanding of form and meaning. By emphasizing the connection between a language's grammatical expressions and their underlying meanings, CG enhances the approach to foreign language instruction and fills the gap between linguistic structure and encyclopedic knowledge.

2.4. Construal

The idea of construal in CG suggests that language is not an objective fact, but rather a reflection of our subjective perceptions and interpretations of the environment. Because there are no entirely neutral methods to describe things, language is therefore intrinsically subjective (Littlemore, 2023). Construal refers to how speakers decide to convey a conceptual representation, which influences how listeners understand it. It is a dynamic process where the most prominent aspect of a scene, called the 'figure,' stands out against the rest of the scene, or the 'ground' (Evans & Green, 2006).

Construal operates at two levels: individual choice and language-specific conventions (Littlemore, 2023). While speakers have some freedom in representing events, languages themselves embed conventional ways of representing events, which can sometimes limit the neutrality of event descriptions. Learning a new language offers not just new words, but also new perspectives, offering insights into different ways of perceiving and articulating experiences. Langacker (1987; 2013; 2017) stresses that meaning is not only about the conceptual content that words convey, but also how humans conceive and portray this content in different ways, highlighting the inherently subjective nature of meaning. This ability to view situations differently indicates that different construals lead to different experiences. Hamawand (2021) states that Construal is a complex phenomenon with multiple dimensions, each encompassing various sub-dimensions. These sub-dimensions reflect how a speaker/text translates experiences into language. Langacker (1987) highlights three aspects of construal: selection, perspective, and abstraction. Various construal operations were classified in literature, but this research focuses on the selection aspect to integrate into CLIL classes since there are rivalry pairs in the biology content, and the student and the teacher should select a particular linguistic expression that reflects its conceptual content.

These insights have significant implications for language education, especially in teaching English as a Foreign Language (EFL), since linguistic units and conceptualization are mutually dependent (Robinson & Ellis, 2008). According to Achard (2008), teaching construal aims to enable students to use language with the same flexibility and fluency as native speakers. Osadnik (2020) highlights the importance of understanding how reality is perceived and reflected in language from the beginning of language instruction. By exposing students to contexts where native speakers naturally make specific linguistic choices, educators can help students internalize these patterns and use the language more authentically. Waara (2004) suggests that immersion in native contexts helps students adhere to conventional linguistic usage, enhancing their ability to communicate effectively and authentically in the new language. This CG-based method of teaching languages not only improves students' language skills but also broadens their cultural and cognitive awareness, enabling them to communicate with the depth and grace of native speakers.

2.5. Integration of CLIL and CG Insights

CLIL is an educational technique that uses a foreign language to teach a variety of courses with the combined objectives of language fluency and content mastery. This method is supported by Vygotsky's sociocultural theory, which holds that language, a means of social interaction and learning through cooperation with more experienced people, plays a significant role in mediating cognitive growth (Vygotsky, 1987). The idea of the Zone of Proximal Development (ZPD), which emphasizes the potential growth that happens when learners are supported just beyond their current competence, is fundamental to this theory. Teachers in CLIL environments scaffold learning, assisting students in bridging the gap between their potential growth and their independent abilities while promoting comprehension through the use of the foreign language (Wood, Bruner, & Ross, 1976).

CG principles offer a strong framework for improving language and cognitive abilities, further expanding the educational impact of CLIL. According to CG, language and cognition are intertwined, with language use influencing cognitive functions and linguistic structures being shaped by cognitive processes including perception, attention, and memory (Coyle, Hood, & Marsh, 2010). This viewpoint fits in well with CLIL since it contends that learning material in a foreign language naturally engages and enhances sophisticated cognitive abilities, making it a very powerful tool for expanding conceptual knowledge.

For example, incorporating CG insights into scientific instruction in a CLIL classroom can greatly enhance the educational process. CG promotes an awareness of how various verbal expressions—like action verbs and spatial prepositions—reflect and influence how we perceive the outside environment. Students acquire the material and gain a sophisticated understanding of how language may be used to describe and analyze scientific phenomena when these linguistic units are taught within the framework of scientific content. By encouraging students to consider ideas from various angles, this approach promotes greater understanding and critical thinking.

Furthermore, studies back up this integrated approach's efficacy. Research has demonstrated that challenging learners to execute intricate mental operations in a foreign language through bilingual and multilingual education environments, such as CLIL, improves cognitive development (Cenoz & Genesee, 1998). Furthermore, as both CLIL and CG frameworks emphasize, interactive practices and situated action participation can enhance students' communicative and authentic language use skills, which are essential for both academic success and real-world application (Dalton-Puffer, 2007; Tyler, 2008; Coventry & Guijarro-Fuentes, 2008).

As a result, combining CLIL with CG greatly enhances students' cognitive and conceptual abilities in addition to promoting language proficiency. It encourages a holistic approach to language education that is deeply embedded within content subjects, where language serves not merely as a medium of instruction but as an integral tool for conceptual growth and cognitive development.

2.6. CLIL and CG Insights in Biology Class

In the biology content, there are action verbs and spatial prepositions that act as rivals. According to the discourse situation, these action verbs within the provided content should be used correctly to give the exact scientific meaning. Hamawand (2016) states that every alternative brings a different aspect of the content into focus, and these different linguistic forms are not arbitrary but rather hold different conceptualizations. When two linguistic expressions convey the same content, they vary based on the different ways the speaker applies to their shared content. Construal addresses the issue of synonymy in language, where pairs of linguistic expressions, whether lexical or grammatical, are thought to have similar meanings. Even though these pairs may share certain characteristics, they can still be differentiated in practical usage (Hamawand, 2016).

Appropriate use of action verbs and spatial prepositions is very important in Biology discourse. These verbs not only portray actions but also shape the student's comprehension of biological occurrences by highlighting various aspects of the processes. In the context of spores, for example, the spatial prepositions into, across, and through have distinct meanings. Into emphasizes the change from one medium to another, which is helpful when highlighting phase or state transitions, as leaving a solid structure and entering a gaseous environment. For ecological debates on how spores colonize new places, across might be a better word to use when describing how spores might be seen as traveling horizontally or spanning a wide area. The word through best captures the intricate journey taken by spores as they combine and mix in the atmosphere, which is important for research on the impact of fungi on different environmental layers. Furthermore, verbs like synthesize, release, and attach, each present a unique perspective on the perception of biological processes. 'Synthesize' may imply the process of creation, 'release' indicates a transition from confinement to liberty, and 'attach' suggests a sense of connection.

A deeper comprehension of the biological contents will be improved by language exercises that successfully present the interpretation of action verbs and spatial prepositions in the CLIL context. Students will be encouraged to refrain from employing synonyms and may be able to better regulate their usage of foreign languages if they concentrate on choosing appropriate conventional linguistic units for the appropriate setting. For instance, comparing the construal of the rivalry pairs of action verbs and spatial prepositions, presenting multiple definitions and letting the students select the most appropriate one, and most importantly drawing the action verbs and spatial prepositions.

2.7. Challenges and Critiques

The implementation of CLIL presents challenges, particularly in teacher training and adapting the curriculum. One major challenge is the need for specialized training for teachers, who must be proficient in both the subject matter and the foreign language used in instruction. This often requires extensive professional development, which can be resource-intensive and time-consuming (Coyle, Hood, & Marsh, 2010). Adapting a curriculum to integrate both content and language objectives also requires careful planning and flexibility (Marsh, 2002), let alone cognitive-based language activities.

Another significant challenge is finding the right balance between language and content learning. Focusing too much on either aspect can undermine the effectiveness of CLIL. For instance, prioritizing language acquisition may detract from content understanding, while focusing solely on content might hinder language development (EURYDICE, 2006). Teachers must strive to support both language proficiency and subject comprehension to address the diverse needs of students with varying levels of language proficiency. This involves continuous assessment and adaptation of CLIL practices to ensure that both language and content goals are effectively met (Tollefson & Tsui, 2004).

One of the major challenges in CLIL is that the content teacher is not willing to teach language. Persuading the content teacher to teach the different perspectives of an action verb and a spatial preposition and how each term or phrase has its construal may persuade the teacher to eliminate the use of synonyms and focus more on the right usage of a content word in a biology class. Meyers, et al., (2015) state that "the role of language and its relation to conceptual development, knowledge construction, and meaning-making" (p. 45) requires a more thorough and persuasive explanation of how content and language interact.

Timing is also a major challenge in adopting Cognitive-based-language activities in a CLIL class. Teachers need a robust plan that tackles both content and language simultaneously. Therefore, explaining the construal of the language units that are related to content gives the student a deeper understanding of the content as well. Achard (2008) highlights the most notable challenge in teaching construal since the EFL teacher tries to enable the students to conceptualize the linguistic units the way native speakers typically prefer. In Biology content evaluation, the researchers concluded that there are complex and abstract concepts, specifically the tricky usage of action verbs and spatial prepositions, and language plays a crucial role in delivering the conceptual understanding.

3. Literature Review

According to San Isidro (2018), CLIL is implemented all around European countries as a revolutionary approach to language learning. Over the past twenty years, the diverse linguistic landscape in Europe has shaped CLIL into an approach that emphasizes language diversity (San Isidro, 2018). This method extends beyond just teaching a foreign language and curriculum content; it also aims to enhance students'

multiple literacies (Meyers, van Woerkom, de Reuver, Bakk, & Oberski, 2015). On the other hand, incorporating CG into EFL teaching is a relatively new trend in language education. Over the last ten years, researchers have been developing pedagogical programs that embrace CG principles. These studies have primarily focused on various linguistic features, including tense and aspect (Niemeier & Reif, 2008; Reif, 2012; Bielak & Pawlak, 2013), active/passive voice (Chen & Oller, 2008; Bielak, Pawlak, & Mystkowska-Wiertelak, 2013), articles (Huong, 2005; Verspoor & Huong, 2008), prepositions (Tyler & Evans, 2004; Tyler, Mueller, & Ho, 2011; Cho & Kawase, 2012; Wijaya & Ong, 2018; Tanaka, 2018), modal verbs (Tyler, Mueller, & Ho, 2010), mood (Llopis-García, 2010), conditionals (Jacobsen, 2012; Jacobsen, 2016), and numerous other aspects.

To the researchers' knowledge, there is a lack of studies on incorporating CG principles into CLIL classrooms. The notable exception is the work by Raitbauer, et al., (2018), which emphasizes the significance of recognizing learners' cognitive structures when implementing CLIL. However, there remains a substantial gap in the literature regarding practical methods for integrating CG insights within CLIL settings. This paper aims to be a foundational study by presenting the challenges and proposing language activities that effectively blend language and content through the lens of Construal theory.

4. Methodology

4.1. Research Design

This research applied a mixed-method approach to collect data from the target population. A mixed-method approach integrates both quantitative and qualitative data within a single study to provide insights that neither approach could offer alone (Creswell & Plano Clark, 2011). The goal of using a mixed-method approach is to gain a more thorough understanding of the phenomenon being studied, which could be impossible to do with a single methodological technique. Furthermore, the mixed-method approach balances the advantages and disadvantages of many research methodologies, lowers bias, provides a practical solution to research difficulties, and improves the accuracy and dependability of the data through triangulation (Denscombe, 2014, p. 160). The mixed-method approach is particularly appropriate for research questions that probe 'what and how' or 'what and why' (Tashakkori & Creswell, 2007, p. 207).

4.2. Setting and Participants

Purposive sampling was used in this study to choose a subset of participants who were thought to be extremely pertinent to the goals of the investigation. According to the school administration, 52 eleventh-grade pupils from a private high school were selected based on their advanced English proficiency levels, which ranged from B2 to C1. These students—27 females and 25 males—were deemed appropriate for the study since they had studied biology for five years and had received their education in English since kindergarten. This particular group was chosen based on the hypothesis that these students would correctly identify and use the appropriate action verbs and spatial prepositions in a biological context and provide accurate answers to previously presented content-related questions because of their language proficiency and extended exposure to biology. This strategy is in line with purposive sampling principles, which call for choosing participants based on their background and expertise related to the study's topic (Palinkas, et al., 2015; Cohen, Manion, & Morrison, 2018).

4.3. Data Instrument Tools

Quantitative data was gathered for this study using a diagnostic test to assess participants' language and topic knowledge, particularly their capacity to identify and correctly conceptualize information. The test was divided into three sections: the second half entailed filling in the blanks to gauge understanding of previously taught material, while the first and third sections were multiple-choice questions that focused on spatial prepositions and action verbs, respectively. According to Cohen, et al., (2018)), diagnostic tests like the one employed in this investigation are intended to pinpoint certain advantages, disadvantages, and difficulties. They help teachers with formative educational planning by identifying needs, challenges, and areas of success. It is important to remember that although these assessments aid in identifying problems in schooling, they do not offer remedies. Rather, they offer crucial information that helps teachers identify the best course of action for upcoming teaching methods or interventions.

A second method of gathering data is semi-structured observation. Two 40-minute sessions per week are held over the course of four weeks. This kind of observation, which falls somewhere between highly structured and unstructured forms, permits both the freedom to see emergent phenomena that naturally arise in the environment and the tracking of particular, predetermined elements.

Semi-structured observation is perfect for gathering authentic, real-time data because of this balancing (Heath, Hindmarsh, & Luff, 2010; Cohen, Manion, & Morrison, 2018).

Researchers concentrated on language and material delivery in the classroom throughout these sessions. To improve student comprehension, special attention was paid to the precision and clarity of the language used to convey important biological terms and concepts, incorporating CG principles. Additionally, the observations assessed whether language explanations and activities are included or designed to deepen content understanding through language-based tasks and the application of construal theory. This method is highly valued for its ability to provide authentic data and is considered one of the most effective means of verifying factual accuracy (Robson, 2002; Simpson & Tuson, 2003; Marshall & Rossman, 2016; Cohen, Manion, & Morrison, 2018).

The observational study also monitored the availability of student engagement and the overall effectiveness of instructional delivery. By adopting a semi-structured approach, the study could flexibly adapt to the natural educational environment while ensuring that all aspects of language and content delivery were meticulously observed and recorded. Ethical considerations were meticulously observed throughout the study. Permissions were obtained from the relevant university, school authorities, teachers, students, and their parents to ensure compliance with ethical standards.

4.4. Research Questions

- To what extent does the teacher integrate CLIL principles and CG insights into biology class instruction?
- How does language proficiency at a higher level influence the ability of biology students to recognize the construal of action verbs and spatial prepositions?

5. Results

The results of the evaluation test are presented in this section. This research examined the 11^{th} grade's language proficiency level in regard to construal. The mean, median and standard deviation are described in accordance with the research questions.

Table (1)

Average mean, median, and standard deviation of Language Proficiency in Recognizing Construals Among 11th Grade Biology Students

Parameters for 54 students	Categories			
	Total: Out of 23	**Q1: Spatial Preposition**	**Q2: Content**	**Q3: Action Verbs**
Mean	11.463	4.611	3.796	3.074
Median	11	5	3	3
Standard Deviation.S	4.689	1.571	2.757	1.552
Standard Deviation.P	4.646	1.557	2.731	1.538

Table (1) displays the statistical analysis of language and content proficiency in recognizing construals among 11th grade biology students. The table provides the average scores for mean, median, and standard deviation from the evaluation test. Overall, the average score across all test components is 11.463. The average scores for recognizing the construal of spatial prepositions, content information, and action verbs are 4.611, 3.796, and 3.074, respectively. The total standard deviation across the test is relatively low at 4.689, indicating minimal variability in student scores.

The mean score for Question 1 is higher in average compared to questions 2 and 3 which suggests that students achieved results in recognizing and using spatial prepositions. In addition, the median score of 5 is the highest among the three questions which indicates consistent performance across the cohort. The standard deviation of both sample and population for question 1 are lower compared to question 2. This indicates that scores for spatial prepositions were less spread out. This implies that most of the students recognized the spatial prepositions.

The mean score for question 2 is 3.796 which is lower than the mean of question 1 (4.611) yet higher than that for question 3 (3.074). This result indicates that the students have some difficulty in mastering the content information. The median score of 3 for question 2 is low which suggests that at least half of the students scored 3 or less out of 7 (the total score for question 2). There is a symmetric distribution since the median aligns with the mean, however the performance level is low. The standard deviation for question 2 is the highest among the three questions. This suggests that there is a greater variability in student performance on content information. In other words, this result might suggest differing levels of understanding of content related context among the students.

The results in question 3 suggest that students face some challenges with recognizing the construal of the action verbs. The table shows that the mean score for question 3 is the lowest (3.074) among the three questions. The median is 3 for this question which suggests that half of the students scored 3 or less out of 7 (the total score of question 3). There is a symmetric distribution of scores if the median is compared to the mean, however it indicates overall lower performance. The standard deviations for question 3 are lower than question 2. This suggests that the scores are not widely spread out but shows lower performance across the group.

5.1. Class Observation

Table (2) presents the data collected from the class observation of 11th grade for four weeks with two sessions each week, each lasting 40 minutes.

Table (2)

Class observation

Teaching Competencies	**Scales**			
	Excellent 70-80	**Good 50-69**	**Needs improvement 30-49**	**Unsatisfactory 0-29**
Content and Language Integration			Explanations are somewhat clear, but minor inaccuracies and unclear	

			language occasionally hinder comprehension. The absence of construal and other cognitive grammar rules affects how precisely and clearly action verbs and spatial prepositions are used in biological explanations.	
Use of Language Activities and Facilitation				Language activities are missing; poor facilitation leads to most students not understanding or applying misusage (synonyms) of actions verbs concepts.
Engagement and Instructional Delivery: Instructional Effectiveness		Instructions are generally clear with occasional confusion; most concepts are		

		understood, but transitions could be smoother.		
Engagement and Instructional Delivery: Student Engagement				Very low engagement, with minimal participation from students; lack of interest evident.

As can be seen, the section on ‘content and language integration’ assessed how well the lesson's language and content were integrated, emphasizing the use of cognitive grammar principles and their clarity. Although the explanations were reasonably clear, there were some significant errors and instances of unclear language, as indicated by the score suggesting a need for improvement. The lesson's linguistic components were not well arranged to support a clear comprehension of biological ideas, as seen by the lack of construal and other cognitive grammar rules, especially in the usage of action verbs and spatial prepositions. Since the cognitive grammar skills that could have improved students' comprehension were not used effectively, this ambiguity probably affected their comprehension.

The needs improvement grade indicates that although the instructions were usually clear, there were times when they were unclear since no language activities were used. As a result, students did not grasp a deep understanding of the construal of the action verbs and spatial prepositions. The teacher used the action verbs in the biology context interchangeably. Integrating the language activities to facilitate the skills, especially in establishing clearer transitions, could significantly improve the overall learning experience.

The Engagement and Instructional Delivery (Instructional Effectiveness) section evaluated how clearly instructions were delivered and how effectively information was presented. The Good score reflects that the majority of instructions were understandable, with only a few points that caused slight confusion, allowing students

to grasp the content overall. While the transitions could have been more seamless, they did not greatly hinder students' understanding. The effectiveness of the instruction delivery indicates a strong basic approach, but improving the transitions could enhance this area even more.

In Student Engagement term**,** it is noted low levels of engagement and minimal participation, indicating that students seemed disinterested in the lesson. This disengagement could be attributed to dull activities, vague instructions, or a lack of interactive elements. To improve this situation, it may be necessary to modify the lesson's framework or introduce more interactive, student-focused activities to enhance participation and motivation.

6. Discussion

This study's findings indicate that students showed relative ease with spatial prepositions compared to the difficulties they encountered with content-related language, particularly action verbs in biology. This outcome seems to reflect principles of Cognitive Grammar, which emphasize that learners often find language linked to physical or concrete experiences—such as spatial relationships—easier to grasp (Langacker, Foundations of Cognitive grammar, 1987). Since spatial prepositions describe tangible concepts students can visualize or relate to real-life situations, this likely aided their comprehension. This is consistent with the theory of embodied cognition, where understanding is seen as rooted in sensory and physical experiences (Lakoff & Johnson, 1980).

Despite the outstanding performance of the students in recognizing the spatial prepositions, results show that they faced challenges in identifying content-related questions, specifically in cases related to action verbs and deeper conceptual understanding. This challenge may be due to the nature of the classroom which was as observed by the researchers, a teacher-centered environment and the content activities from the textbook were overlooked which were perfect chances for integrating language related activities applying CG principles. According to Hamwand (2016), applying CG principles-especially focusing on form-meaning connection would deepen students' conceptual understanding of complex ideas. Furthermore, balancing the focus between language and content, which can be practiced following CLIL, can facilitate learning outcomes (Coyle, Hood, & Marsh, CLIL: Content and language integrated learning, 2010).

Subsequently, in line with Vygotsky's Sociocultural Theory (1978), this approach can foster an interactive environment that promotes collaborative learning, ultimately leading to a deeper understanding of complex concepts.

The third significant result showed that students need more language support to develop a more advanced understanding of biological terms. The action verbs used in biology are precise, and students mistakenly believed they could be used interchangeably, as evidenced by the high percentage of students selecting "could be used interchangeably" in question 3. Based on the data collected from the class observation, the explanations were somewhat clear, but minor inaccuracies and unclear language occasionally hindered comprehension. The explicit teaching of content-related verbs was missing, which impacted the clarity and precision of action verbs and spatial prepositions in biological explanations. This, in turn, contributed to the students' poor performance on the test. Therefore, integrating content and language-related explanations into the classes would greatly benefit students' deep understanding of biological concepts.

This claim is supported by Tyler's (2008) research on modal verbs. Although the study focused on law students who were native speakers, they faced challenges in identifying the contextual construal of modal verbs. However, after explicit teaching in cognitive linguistics, their understanding improved. Similarly, a shift towards the CG approach, particularly its emphasis on construal, is necessary in the context of this study. Through the explicit teaching of various action verbs used in biological processes, students' comprehension of these concepts would improve, enabling them to engage more cognitively (Langacker, Foundations of Cognitive grammar, 1987; Hamawand, Construal, 2021).

Moreover, as indicated in the 4Cs framework by Coyle, et al., (2010), higher order thinking skills can be enhanced once CLIL and CG are applied due to the characteristics of those approaches. The focus of CG on how language replicates our cognitive functions might be beneficial to understanding the complex link between content, communication, cognition, and culture in CLIL. With this dual approach, students are not only learning biological content but also developing the linguistic precision necessary to effectively express and engage with this content. This prepares them for higher levels of academic inquiry because it addresses both linguistic accuracy and cognitive skills (Mehisto, Marsh, & Frigols, 2008).

This is strengthened by CG's method of investigating the form-meaning relationship (Langacker, Essentials of cognitive grammar, 2013), which encourages students to recognize the links between linguistic decisions and the ideas they stand for. Teaching students to examine various biological action verb construals, for example, will enable them to see how language portrays biological processes in many ways, which is essential for precise scientific comprehension.

According to the findings, the students struggle with the accurate use of action verbs and biological content comprehension, but they have a firm grasp of spatial prepositions because of their embodied experiential foundation. These results highlight the need for a more comprehensive teaching strategy that incorporates CG's understanding of meaning and construal with CLIL's content-language emphasis. Through more interesting, interactive learning activities backed by clear instruction, students can improve their performance in biology by solidifying their language and topic knowledge. According to research, this combination strategy improves language competence, sharpens thinking skills, and facilitates the application of these skills in practical science situations.

7. Conclusions

This study investigates the use of CLIL with Construal in teaching spatial prepositions and action verbs in a biology class at a private high school. The following conclusions were drawn from the diagnostic test and class observation:

1. The classroom instruction is observed to be teacher-centered, with almost no integration of CLIL principles or CG insights at all.
2. The integration of CLIL and CG insights might enhance linguistic accuracy and improve the understanding of biological concepts.
3. Due to their embodied experiences, students demonstrated moderate ability to recognize spatial prepositions.
4. Due to the absence of explicit instruction and precise explanations of language concepts in biology, coupled with the synonymous use of action verbs, students struggled to select the appropriate verb for the correct discourse context.
5. The students' level of proficiency alone was insufficient for the correct use of the construal of biological concepts without explicit teaching.

8. Pedagogical Implications and Suggestions for Further Studies

This study underscores the feasibility and potential benefits of integrating the CLIL with CG insights—specifically construal—into biology instruction. The findings indicate that understanding the construal of spatial prepositions and action verbs can significantly deepen students' grasp of biological content while simultaneously elevating their language awareness, even among learners with English proficiency levels of B2 and C1. By merging these approaches, educators can diminish the reliance on rote memorization of content and efficiently use class time, as explaining construals inherently addresses both language and content.

To practically implement these insights, biology teachers instructing in English might consider the following language activities to enhance the understanding of construals:

- **Comparative Analysis of Construals**: To determine how these decisions affect how biological processes are interpreted, teachers can lead exercises in which students contrast the construals of rivalry action verbs or prepositions. Students can better grasp the differences between the verbs "produce" and "emit" by comparing them in various contexts. For instance, "produce" implies a regulated, intentional biological function, whereas "emit" denotes a more passive release of material. In addition to highlighting the variations in verb usage, this activity challenges students to consider how word choice affects perspective and meaning in biological descriptions. Additionally, this activity could be extended to analyze sentences that contain spatial prepositions or action verbs, examining each choice's consequences on the sentence's meaning.
- **Visualization and Drawing of Construals**: Asking students to use certain spatial prepositions and action verbs to sketch and illustrate how they understand scenes is another useful exercise. Students can demonstrate their comprehension of how language frames biological processes through this exercise, which promotes active involvement. Students can investigate and strengthen their comprehension of how prepositions and verbs influence how space and action are conceptualized in biological contexts by sketching up situations.

In addition to teaching biological vocabulary, these tasks are designed to ensure that students have a comprehensive understanding of how language impacts knowledge in the subject of biology.

By encouraging stronger cognitive links between language use and scientific comprehension, these instructional techniques can raise student engagement and overall academic accomplishment.

This study also raises the possibility that additional research in other STEM fields may be required to examine the relevance of CLIL and CG findings. To improve the teaching of linguistic units within the CLIL language activities, for example, the investigation can entail including theories of meaning other than Construal. The context of multidisciplinary education may benefit much from such investigations.

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