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Abstract.

This article explores the application of the CLIL approach in science teaching through the

study of the life cycle of butterflies. CLIL allows for the simultaneous teaching of scientific content and a foreign language, promoting deeper and more meaningful learning. The butterfly life cycle provides an ideal context for CLIL, as it allows students to observe, analyze, and describe phenomena in a second language, thereby improving their cognitive and linguistic competence.

Key words: CLIL (Integrated Content and Language Learning); bilingual education; English as a Foreign Language (EFL); Innovative pedagogical trends.

Resumen.

Este proyecto explora la aplicación del enfoque CLIL en la enseñanza de las ciencias a través del estudio del ciclo vital de las mariposas. CLIL permite la enseñanza simultánea de contenidos científicos y una lengua extranjera, fomentando un aprendizaje más profundo y significativo. El ciclo vital de la mariposa ofrece un contexto ideal para el CLIL, ya que permite a los estudiantes observar, analizar y describir fenómenos en la segunda lengua, mejorando así su competencia cognitiva y lingüística.

Palabras Clave: *CLIL (Del inglés "Aprendizaje Integrado de Contenidos y Lenguas Extranjeras"); Educación bilingüe; inglés como lengua extranjera (EFL); Tendencias pedagógicas innovadoras.*

TABLE OF CONTENTS

VIGILADA MINEDUCACIÓN - SNIES 1704

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Introduction. 4
OBJECTIVES. 7
THEORICAL FRAMEWORK. 8
English Language for Natural Science Learning Difficulties and Challenges. 10
METHOD DESIGN. 16
Results. 32
ANALYSIS OF RESULTS. 84
Findings 94

- Comprehensive diagnosis through data triangulation (students, teachers, and families). 94
- Active participation of the educational community, strengthening sustainability and sense of belonging. 94
- Cultural and linguistic adaptation to avoid frustration and promote inclusion. 94
- Need for more specific linguistic indicators. 94
- Potential for replication in other bilingual educational contexts. 94
- Student motivation is enhanced by active and personalized methodologies. 94

CONCLUSIONS. 101
LISTA DE APÉNDICES. 106

VIGILADA MINEDUCACIÓN - SNIES 1704

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Introduction.

This project is intended to be developed in a private institution located in northern Bogotá. The goal is to develop an experimental design proposal that can be implemented by science teachers. Science teachers all have backgrounds in languages or English language teaching; however, none of them have formally studied natural sciences, and have expressed discomfort when developing practical activities with children, since they lack the training or are unaware of the importance of experimental practices in teaching natural sciences.

Therefore, this project offers the opportunity to explore an alternative experimental design that can be developed with children. The plan is to implement the activities in this teaching unit with fourth-grade students who are on a reasonable adjustment plan, since it is expected that this proposal will accommodate students with special needs in their learning process. After exploring methodologies for designing and developing the project, the CLIL methodology was found to be the most optimal, considering that it proposes alternatives for integrating the teaching of content specific to a field of knowledge with the learning of communication skills in a second language.

Content and Language Integrated Learning (CLIL) is an educational approach that teaches a subject and a foreign language simultaneously. This innovative method is gaining ground in science education, where the integration of scientific concepts with language acquisition fosters more experiential, deeper learning, and greater language proficiency. The theme of the butterfly life cycle is an ideal pillar for CLIL, as it combines tangible, experiential biological processes with rich, interactive learning activities for bilingualism.

VIGILADA MINEDUCACIÓN - SNIES 1704

Research underscores the importance of scaffolding in CLIL contexts to address the challenges learners face: mastering complex scientific ideas using academic language with appropriateness. For example, scaffolding techniques, such as visual aids and guided inquiry, help learners articulate scientific observations while gaining linguistic fluency (Lo & Lin, 2021).

To effectively integrate CLIL in the context of bilingual education, educators must examine how this methodology aligns with current pedagogical trends and priorities. Key areas of research include the role of CLIL in promoting dual learning (in which students acquire both content knowledge and language skills) and its impact on cognitive development and intercultural competence. Recent studies highlight the importance of scaffolding techniques and adaptive strategies in helping learners overcome the dual challenges of mastering complex academic content and foreign language fluency (Lo & Lin, 2021). The butterfly life cycle, with its clear stages from start to finish, provides a practical context that encourages learners to hypothesize, describe, and analyze phenomena as they make use of and implement the second language. As Mehisto et al. (2021) point out, meaningful content creates natural opportunities for language use, making projects such as this one critical to the success of CLIL implementation.

From a linguistic perspective, CLIL reinforces communicative competence by strengthening language use in subject-specific contexts. Performance-based assessments, such as the presentation of results on butterfly metamorphosis, encourage learners to articulate complex ideas while enhancing their academic language skills (Lo & Lui, 2021). The process of

VIGILADA MINEDUCACIÓN - SNIES 1704

observing, documenting, and sharing knowledge in English fosters the development of students' cognitive and linguistic abilities.

This project also embraces global educational goals, emphasizing sustainability and bilingualism as tools for 21st-century education. By linking natural science concepts with language learning and citizenship, the project not only meets curricular standards, but also prepares students to function in a multilingual and environmentally conscious world (Tang, 2021).

Integrating CLIL with science subjects through a project on the life cycle of butterflies represents an engaging and effective pedagogical approach. By combining language-rich topics connected to the real world, a proposal emerges in which teachers can create a rich and dynamic learning environment that will foster the integral development of the learner by seeking to answer the core question:

How are the results of implementing the Butterfly cycle project in terms of the integration of CLIL as a methodology and the competences development in natural science, citizenship and EFL learning in a group of primary school students?

VIGILADA MINEDUCACIÓN - SNIES 1704

OBJECTIVES.

Main Objective:

To analyze the impact of implementing the Butterfly Cycle project in terms of integrating the CLIL methodology and developing competencies in Natural Science, citizenship, and EFL learning among primary school students

Specific Objectives:

To identify difficulties and needs in bilingual elementary natural science classrooms.

To design and propose a project for teaching Natural Science through the CLIL approach that addresses the identified difficulties and needs by means of a pedagogical tool.

To determine the impact and outcomes of the implementation, consider learners' voices, perceptions, and the development of their competencies.

VIGILADA MINEDUCACIÓN - SNIES 1704

THEORICAL FRAMEWORK.

Bilingualism From the Perspective Of CLIL.

Bilingualism is defined as the ability to use two or more languages in daily life, though proficiency levels can vary across different contexts (Byalistok, 2021). Bilingualism is also necessary, according to Coyle (2019), to competently develop in a globalized world across different authentic contexts, allowing for practical and functional performance. Bilingualism, from the CLIL (Content and Language Integrated Learning) methodology, is the way to learn content from a specific area in two languages: a native language and a foreign language in a globalized world (Marsh, 2024). Bilingualism can be enhanced by practicing real-life learning situations, which, through the CLIL methodology, can increase students' proficiency in both languages as well as in the content being addressed (Dalton-Puffer, 2022). Bilingualism as a methodology, but also as a facilitator of the teaching process of other content, aims to generate a teaching-learning process, whether with the native language and a foreign language, or a second language in places where there are two or more local languages (Lasagabaster, 2018).

According to (Banegas, Poole, & Corrales, 2020) Bilingual education generally combines a community's mother tongue (L1) with an additional language, usually English. This model is expanding globally, especially in formal and private educational contexts. The successful implementation of bilingualism depends on teacher preparation, adapted materials, and the level of linguistic competence of the students. It is perceived as an elitist tool, limited to contexts with

VIGILADA MINEDUCACIÓN - SNIES 1704

advanced resources and students with solid linguistic skills.

One of the most prominent authors of the CLIL methodology is Banegas, in his many publications, talks about this strategy, its implementation in different school contexts, and the results or advantages it can generate. For him, CLIL methodology is defined as an educational approach that integrates the teaching of curricular content and an additional language (such as English), encouraging the simultaneous learning of content and language skills. Its theoretical bases include sociocultural theory, cognitive engagement, and a functional language perspective. It is based largely on a language-driven approach, using curricular themes to teach English as an additional language. Implementations are common in private institutions and often include collaborative projects, authentic materials, and tasks that promote communicative and cognitive competencies (Banegas, Poole, & Corrales, 2020).

It also promotes the development of global citizenship, intercultural competencies, and meaningful learning connected to the curriculum. Challenges include a lack of teacher preparation and specific materials adapted to local contexts. Teacher training for CLIL in Latin America is limited, requiring a more structured approach in undergraduate programs and professional development.

For Martin, 2022 CLIL is an educational methodology where content learning (e.g., natural sciences) is done in an additional language. It combines content learning and language skills development.

VIGILADA MINEDUCACIÓN - SNIES 1704

English Language for Natural Science Learning Difficulties and Challenges.

In Salloum (2020) there is a tendency to use English rigidly in private schools, even if this hinders conceptual understanding. In contrast, in public schools, teachers integrate Arabic to clarify concepts, which seem to favor comprehension. Teachers play a crucial role as mediators of social and academic language, using strategies such as translanguaging (flexible use of multiple language resources) to overcome language barriers in science teaching.

The integration of a second language as a medium for teaching subjects such as science, commonly referred to as Content and Language Integrated Learning (CLIL), offers numerous educational advantages. However, this approach also presents significant challenges for both teachers and students. The following are some of the challenges that teachers report and that they have faced when integrating CLIL methodology into their classrooms.

Insufficient Training and Professional Development.

One of the main problems is the lack of training and professional preparation for teachers. Many educators are proficient in a foreign language, but lack the pedagogical skills needed to simultaneously teach complex science content. According to Johnson and Smith (2022), “teachers often feel unprepared to balance the demands of language teaching with the depth required for scientific topics” (p. 45). This lack of training can generate ineffective teaching spaces that do not fully strengthen language acquisition and content mastery.

VIGILADA MINEDUCACIÓN - SNIES 1704

Resource Constraint.

Teachers often find it difficult to access CLIL materials that are appropriate and adaptable to their learners' skill levels. As noted by Lee et al. (2021), “the scarcity of high-quality, science specific CLIL resources forces teachers to spend considerable time adapting existing materials, which can be time-consuming and challenging” (p. 112). This lack of resources can hinder the ability to deliver comprehensive and engaging lessons.

Comprehensive And Holistic Assessment.

Assessing learners in a CLIL environment presents the dual challenge of assessing both language proficiency and subject matter comprehension. Brown and Garcia (2023) highlight that “traditional assessment methods are often inadequate to capture nuanced progress in both language and content areas, leading to potential gaps in learner assessment” (p. 78). The development of fair and effective assessment tools that address both dimensions remains a major obstacle.

In addition, we have inquired about the different challenges faced by students in terms of their integration and interaction with the learning of sciences through the clil methodology. Let's look at some of these challenges.

Language Barriers.

Students may have difficulty understanding scientific terminology and concepts in a language other than their native language. Nguyen and Tran (2022) found that “limited foreign language proficiency may prevent students from grasping complex scientific ideas, resulting in superficial learning” (p. 134). This barrier can decrease students' interest and motivation in both languages and subject matters.

VIGILADA MINEDUCACIÓN - SNIES 1704

Subject Overload.

The simultaneous demands of learning a new language and mastering subject-specific content can overwhelm learners. As Kim and Park (2021) highlight, “the dual focus required in CLIL environments often leads to cognitive overload, in which learners find it difficult to retain and apply information effectively” (p. 98). This overload can negatively affect academic performance and overall learning experience.

Lack of Motivation.

Maintaining motivation can be difficult when students face challenges in understanding and expressing concepts in a foreign language. Garcia and Lopez (2023) observed that “students may experience frustration and decreased motivation when they repeatedly encounter language-related obstacles in their science studies” (p. 202). This decrease in motivation can affect academic engagement and performance.

To mitigate these challenges, several strategies have been proposed. Enhancing professional development programs focused on CLIL methodologies can equip teachers with the skills needed to effectively balance language and content instruction (Hernandez, 2023). In addition, developing and sharing high-quality science specific CLIL resources can ease the burden on teachers and improve classroom quality (Wang and Liu, 2021). Implementing formative assessments that evaluate both linguistic and content comprehension can provide a more complete picture of learners' progress (O'Connor, 2022). Finally, fostering a collaborative classroom environment in which students support each other's learning can help manage cognitive load and maintain motivation (Chen & Huang, 2024).

VIGILADA MINEDUCACIÓN - SNIES 1704

In conclusion, while integrating a foreign language into science education through CLIL offers significant benefits, it also presents considerable challenges. Addressing these difficulties requires targeted professional development, adequate resources, effective assessment strategies, and supportive classroom practices to ensure both teachers and students can thrive in this dual-focused learning environment.

Although integration of a foreign language into science education through CLIL offers significant advantages, it also poses considerable challenges. Addressing these challenges requires ongoing professional preparation, adequate resources, effective assessment strategies, and supportive classroom practices to ensure that both teachers and learners can succeed in this learning environment.

Individual Reasonable Accommodation Plan (PIAR).

The Individual Plan of Reasonable Adjustments (PIAR) is a key educational tool established in Colombia to ensure the right to inclusive education for students with disabilities. It was introduced under Decree 1421 of 2017, as part of the national framework for inclusive education. It is designed to guarantee effective teaching and learning processes by identifying and implementing necessary support and adjustments to allow the student to participate, remain, and progress in the educational system. These adjustments may include Curricular adaptations, teaching and evaluation strategies, infrastructure modifications, and the use of assistive technologies. The PIAR must be developed within the first trimester of the academic year, or within 30 days of the student's enrollment if it occurs in mid-year. It must be updated annually. The PIAR must include, at a minimum, the following elements:

VIGILADA MINEDUCACIÓN - SNIES 1704

- ***Context Description****:* General information on the student's family, society, and school environment.
- ***Pedagogical Assessment****:* Evaluation of the student's strengths, needs, and educational potential.
- ***Health Professional Reports****:* Documentation from specialists that supports and informs necessary adjustments.
- ***Learning Goals****:* Individualized objectives tailored to the student's potential.
- **Curricular, didactic, evaluative, and methodological adjustments**: Adaptations to the regular curriculum to support inclusion.
- ***Resources****:* Specification of physical, technological, and didactic materials required.
- ***Specific projects****:* Individualized interventions or programs within the school.
- ***Relevant additional information****:* Any other factors affecting the student's learning.
- ***Home activities****:* Tasks designed to continue learning at home, especially during school breaks.

The PIAR serves as an individualized teaching and planning tool that ensures each student's learning needs are addressed within an inclusive environment. It: Is part of the teacher's annual planning, guides curriculum delivery, helps define evaluation methods suited to the student, promotes collaboration among teachers, support professionals, the student, and their family. If the student's evaluation differs from the standard institutional process, a final pedagogical progress report must be attached at the end of the school year.

VIGILADA MINEDUCACIÓN - SNIES 1704

According to General Education Law 115 of 1994, Chapter 1 establishes regulations for providing the right to education to individuals with disabilities or exceptional abilities. This chapter stipulates that both public and private institutions must have inclusive policies in which children and adolescents feel welcomed and educated according to their disability or their learning needs. Considering the above, the institution where this proposal is planned to be developed (Anglo Americano School) has implemented an individual reasonable adjustment plan since its founding. This plan considers the personalized diagnosis issued to the student by an entity or professional external to the institution who works in the educational environment. Parents can use this service at the suggestion of the institution's staff or on their own initiative. Based on this diagnosis, the psychology team is responsible for proposing and sharing adjustments to be considered for each subject. These adjustments can be reviewed by all subjects and are considered when developing assessment activities. Therefore, students with adjustments or who have an individual reasonable adjustment plan take exams with fewer questions, without answer tables, and other specifications that are made considering their needs.

Teachers fill out a form that specifies the student's strengths and describes the learning barriers. This has nothing to do with the student; it is the difficulty of the learning environment that does not favor the development of the cognitive skills of the subject. Finally, each teacher develops a proposal to overcome this barrier.

On the other hand, there are other students who are not in the PIAR program; however, they have specific adjustments determined by the psychology team, which consider the diagnoses of external psychiatrists, neuropsychologists, and occupational therapists. A general recommendation

VIGILADA MINEDUCACIÓN - SNIES 1704

when dealing with these students is essential to ensure that the instruction is clear to them, give them leadership roles within the classroom, and provide reinforcement activities to enhance their learning.

METHOD DESIGN.

The group will carry out an educational action-research study to measure the impact of the tool on the difficulties identified in primary bilingual natural science classrooms, from the curricular, citizenship, and EFL aspects. This methodology allows us to design and implement a tool, such as a primer, subsequent analysis and reflection, and adjustments according to the results obtained.

This methodology is currently a trend in educational research and is used for implementation and adaptation to the context of different educational proposals. As Alban (2020) highlights. This approach begins with an initial diagnosis, allowing participants to analyze specific issues, co-develop actionable solutions, and evaluate the impact of these actions. Each cycle fosters deeper engagement and learning, leading to continuous improvement.

VIGILADA MINEDUCACIÓN - SNIES 1704

Action Research in Education.

Action research is particularly significant in educational contexts, as it enables educators and stakeholders to reflect on their realities, identify challenges, and implement meaningful changes.

"Action research proves to be an invaluable tool in education due to its integration of knowledge production and active problem-solving. It promotes participatory engagement and collective learning, enabling educational communities to transform their realities meaningfully. By addressing both practical challenges and theoretical questions, this methodology serves as a cornerstone for sustainable educational improvement."

Also, Molina,2021. evaluates the use of **Participatory Action Research (PAR)** to improve educational quality in a Colombian educational institution. It emphasizes the integration of research with action to address systemic challenges in educational management and pedagogy. It also highlights this methodology as a dynamic and inclusive methodology for enhancing educational quality. It bridges theoretical frameworks with practical interventions, enabling schools to adapt curricula to evolving contexts while empowering educators and engaging the community.

The methodological design will be carried out in 6 steps. First, an initial diagnosis will be made to identify the difficulties and needs that are present in the bilingual classrooms of natural sciences and English in primary school, as well as the level of competencies in the two areas, this will be done by means of observation and empiric but also surveys and documentary analysis will be implemented.

VIGILADA MINEDUCACIÓN - SNIES 1704

The second step consists in the design of a pedagogical tool that can be applied in the above-mentioned context, by means of the CLIL methodology, in this case a booklet will be built on the specific topic of the butterfly cycle, which is applicable for bilingual classrooms and for primary school, the idea is that it is a booklet that responds to the needs and difficulties detected.

The third step is the implementation of the educational strategy in public and private institutions in the city of Bogota, which have bilingual elementary school classrooms. The idea is not only to use the booklet in isolation, but as a tool to accompany the teachers' lesson plans to integrate the CLIL methodology in these classrooms.

The fourth step will be to collect information on the results that can be evidenced regarding the implementation of the strategy and the tools implemented in classrooms. It is planned to record the results through observation, but also to listen to the assessment of teachers and students involved.

Stages 5 and 6 are more for reflection and analysis of the collection of all the information regarding the primer, but also the CLIL methodology, and to propose improvements for the exercise for future implementations in different school contexts.

VIGILADA MINEDUCACIÓN - SNIES 1704

Chart #1 Schedule.

Etapas del protector .	Activities	2024		2025					
		Agu Sept.	Oct. Nov.	Dic. Jan	Feb. Mar.	April Mayo	June July	Agu. Sept.	Oct. Nov.
Stage 1 **Identification of the problem or generation of the research interest.**	Identification of problems in educational institutions.								
Stage 2 **Selection of referents and basic concepts.**	Collection of background and theoretical information on the CLIL model applied to the natural sciences and English.								
Stage 3 Methodological	Instrument design.								
	-Validation of instruments.								

VIGILADA MINEDUCACIÓN - SNIES 1704

design.	-Informed consent management.								
	Application of the instruments to the participants.								
Step 4 **Interpretation of information and analysis of results.**	Collection, interpretation, and analysis of results.								
Step 5 **Completion of the project.**	Creation of a digital primer with the CLIL methodology according to the identified needs.								

Characterization of the Population.

This proposal is addressed to science teachers who currently work in a private School. The project will be implemented with fourth-grade students; they are 10 years old and have been studying in the institution for 3 years.

Regarding the school, it has a private character and is in the northern part of Bogotá (Cll 170 # 8-80). In the following chart, the students were described, considering the psychology department criteria, since some of them belong to the reasonable adjustments plan known as PIAR,

VIGILADA MINEDUCACIÓN - SNIES 1704

and the other has a differentiated academic process, due to psychology department considerations.

Chart # 2 Characterization of the Population

Student	Diagnostic	Classroom recommendations	General characteristics
Student #1	Difficulty in reading comprehension	Evaluative activities without an answer sheet	The student excels at performing actions that promote the well-being of his classmates. This interview is conducted to ask the student to complete activities completed in his absence, and to ask more questions in class to promote subject learning.
Student #2	Attention Deficit Disorder	If this is the case, help Lucas pause his behavior so he can analyze his options (don't explicitly state these options) (help him construct them). *To help student 2 develop impulse control, use the	The student excels at actively participating in class, asking questions, and providing input that enriches the class. This interview is conducted to suggest that the student be more

VIGILADA MINEDUCACIÓN - SNIES 1704

		traffic light system: Red is stop, orange is think, and green is act. *Student 2 has difficulty regulating emotions when faced with frustration. When he exhibits disruptive behavior when faced with frustration, ask him to apply the breathing techniques he knows. *Within the group, try to alternate the leader to teach Lucas that he can also be a follower and thus cope with stressful situations.	effective in following instructions and promoting the timely submission of assessment exercises, thereby improving his academic performance in the subject.
Student #3	Cognitive failure in visual perception processes, spatial management, central language attention, and executive functions.	-Encourage and allow you to read aloud. -When conducting reading tests, go from the literal to the abstract. -Additional time for activities. -Anticipate what will be seen and done at the beginning of the class session. -Boost self-esteem by constantly reinforcing progress. -Remind students that they can read by finger-tracking. -Give complex	The student follows the steps of the scientific method to perform experimental exercises and communicates respectfully with his classmates and teacher.

VIGILADA MINEDUCACIÓN - SNIES 1704

		content in advance, only the topics and some suggested resources where they can consult the information. -Allow students to reinforce what is being assessed through oral communication. -Provide external strategies that make math less abstract: use of calculators, drawing paper, or diagrams. DIFFERENTIATED ASSESSMENT: All except math. *Allow oral assessment when required. *Allow more time	
Student #4	Difficulty with basic learning devices	Fewer points on assessments, more time on activities, and when oral assessment is required.	The student demonstrates a continued interest and motivation to explore new knowledge, which aligns with the Anglo-American value of a deep desire of learning. She also treats her classmates and

VIGILADA MINEDUCACIÓN - SNIES 1704

			teachers respectfully, completing her academic duties in a timely manner.
Student #5	Student 5 faces barriers in the curriculum and learning processes, as activities involving combined operations and inductive reasoning can be challenging when they require extensive processes. Furthermore, organizing information and applying strategies to arrive at a solution can be	To support him, an oral step-by-step guide will be implemented to allow him to approach problem-solving in a structured manner. He will be asked to verbalize what he understood before beginning the activity, to reinforce his understanding and organization of the process. In addition, visual aids, such as images, will be used, or step-by-step instructions will be written in his notebook to facilitate the structure and understanding of lengthy processes. Instructions will be provided orally and sequentially, ensuring clarity. In workshops and assessment activities, he will be	The student shows interest in describing the phenomena found in his natural environment, providing interesting data related to the topics explained.

VIGILADA MINEDUCACIÓN - SNIES 1704

	complex, impacting his work rate and the accuracy of his responses.	provided with the same materials as the rest of the group, but will be assigned fewer exercises to complete, allowing him to focus on the quality of his work and the effective application of strategies.	

Sample Selection

First, the alignment between the project objectives and the curricular frameworks of the Science area was considered, since these are designed in accordance with the Basic Learning Rights established by the Colombian Ministry of National Education. In this way, the proposed project would have a potential scope of applicability at the national level.

Consequently, the fourth-grade students taught by one of the master's students were selected. Based on the suggestions made during a meeting of the Promotion and Commission Committee from the Biology Department, it was decided to work with students who are currently under an Individual Reasonable Adjustment Plan, as they require reinforcement activities in the Science area.

Accordingly, a total of five students were selected, along with their respective parents.

Once parental authorization had been obtained, institutional approval was requested from the school principal, considering the suggestions provided by teachers who had previously developed master's degree projects at the institution and were familiar with the established protocol.

VIGILADA MINEDUCACIÓN - SNIES 1704

The instrument completed by the parents included several open-ended questions aimed at identifying the ways in which students practiced English at home, their interest in learning science, and the way they had learned English throughout their academic experience.

Ethical Considerations and Authorization Process

Initially, permission was requested from the institution in accordance with the ethical guidelines suggested to the master's students, and with the purpose of receiving feedback from the administrative staff of the Anglo Americano School, where this project is intended to be implemented. Subsequently, the process of designing and validating the instrument by experts was carried out.

The data collection stage began once parental authorization was obtained for the processing of personal data and information, considering that the VAK test was applied to minors under 14 years of age.

According to Colombian legislation, the personal data of minors receive special protection, and their processing is prohibited except when it concerns public information, in accordance with Article 7 of Law 1581 of 2012, and when such processing complies with the following parameters and requirements:

VIGILADA MINEDUCACIÓN - SNIES 1704

- It must respond to and respect the best interests of children and adolescents.
- It must ensure respect for their fundamental rights.

Once these requirements are met, the legal representative of the child or adolescent shall grant authorization after the minor has exercised their right to be heard, and their opinion shall be considered based on their maturity, autonomy, and ability to understand the matter.

All people responsible for or involved in the processing of minors' personal data must ensure their appropriate use. For this purpose, the principles and obligations established in Law 1581 of 2012 and its regulatory decree must be applied.

After obtaining the necessary permissions, the process continued with the expert validation stage. At this point, two teachers from the institution who were also trained in the CLIL methodology reviewed the instrument and provided their suggestions using the format established by the university. After incorporating the experts' recommendations, the instrument was implemented, followed by the final stage of analysis.

The same procedure was followed by the other instruments. The following figures illustrate the dates on which the previously described steps were carried out.

VIGILADA MINEDUCACIÓN - SNIES 1704

Figure 1: Data collection figure

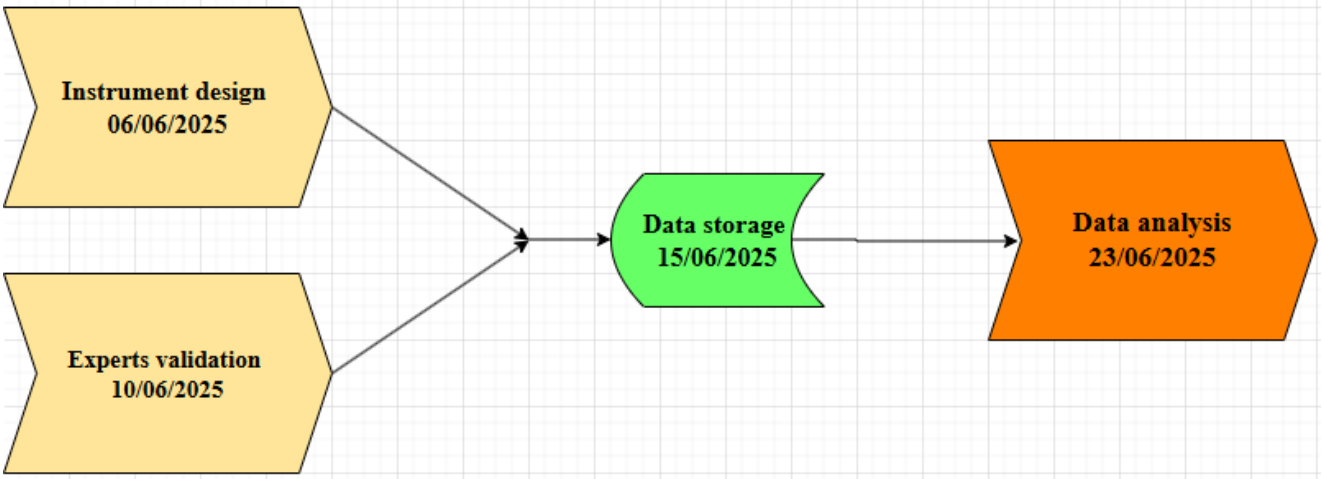
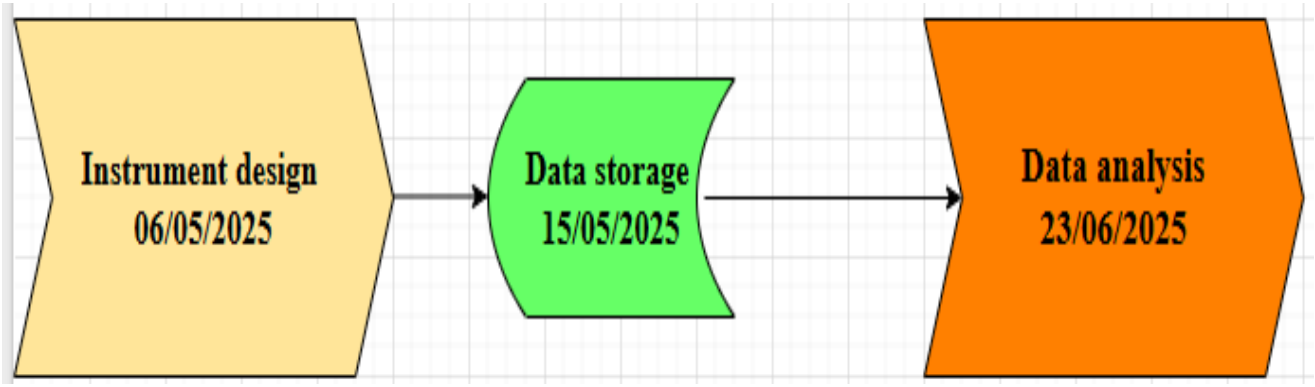


Figure 2: Data collection figure



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VIGILADA MINEDUCACIÓN - SNIES 1704

Instruments.

The master's students propose these instruments to identify the type of learning style with which the students, to whom the thesis project will be directed, feel most comfortable.

The first one is Vak Test, the theoretical framework considered was the one established by Cazau (2004), which defines a learning style as the cognitive, affective, and physiological traits that help identify how students perceive and respond to a learning environment. In this way, three types of learning styles are established: kinesthetic, visual, and auditory.

For this study, the VAK test was used as an instrument to identify students' learning styles. Based on these results, a differentiated strategy is introduced within the CLIL (Content and Language Integrated Learning) method. According to Özdemir et al. (2022), personalized learning and the use of innovative teaching strategies offer the potential to improve students' academic performance and motivation. Likewise, Pérez-Pérez and Castro (2024) emphasize that teacher education in differentiated instruction is key to personalizing teaching according to students' individual needs.

The second instrument is a Conducting interview with teachers in bilingual environments who implement the CLIL (Content and Language Integrated Learning) methodology, which is essential for understanding and improving educational practice. These interviews allow for the exploration of teachers' perceptions, experiences, and needs, facilitating a more effective implementation of the CLIL approach.

VIGILADA MINEDUCACIÓN - SNIES 1704

Firstly, teacher interviews offer in-depth insight into how the CLIL methodology is perceived and applied in specific contexts. For example, a study in Bogotá revealed that many teachers had limited knowledge of the principles of CLIL and expressed the need for training programs tailored to their local context (González, 2020). By understanding these perceptions, institutions can design more effective and context-specific training strategies.

Moreover, interviews help identify challenges and opportunities in the implementation of CLIL. In a study conducted in Spain, it was found that teachers who had received specific training in CLIL used a wider variety of classroom activities and resources compared to those without such training (Alcaraz-Mármol, 2021). These findings highlight the importance of continuous professional development and how interviews can uncover key areas for teacher growth.

The third instrument is a diagnostic survey to parents, because to ensure that the project is relevant and effective, it is essential to understand each student's individual characteristics, their level of English proficiency, their interest in science, and the environment in which they are developing. For this reason, this survey aims to gather valuable information about these aspects. According to the *Organization for Economic Co-operation and Development* (OECD, 2021), initial diagnostic assessments are key tools for adapting the educational process to students' needs and maximizing the impact of learning.

VIGILADA MINEDUCACIÓN - SNIES 1704

Active family involvement is a crucial factor for the success of this type of project, especially in bilingual educational contexts. According to Escobar Alméciga and Gómez Sara (2020), parents play an essential role in students' motivation and academic performance, as support at home reinforces what is learned in the classroom. Collaboration between school and family promotes inclusive education that respects students' cultural and linguistic differences, fostering a positive and equitable learning environment.

This survey aims to collect key information about your children's academic needs, the resources available at home, and parents' expectations regarding the project. Based on this information, we will be able to adapt the pedagogical approach to the students' characteristics and contexts, ensuring that all of them have the best opportunities to learn and grow in a bilingual environment.

We deeply appreciate your participation in this survey, as your collaboration is essential to ensure the success of the project and to meet the individual needs of each student. Your support in this process will help your children achieve the project's goals, develop scientific and linguistic competencies, and become actively involved in their own learning.

For the development of this pedagogical proposal, the informed consent of the educational institution and of the parents was previously obtained, as well as the assent of the participating students. The school administration formally authorized the implementation of the project after

VIGILADA MINEDUCACIÓN - SNIES 1704

the presentation of the work plan, objectives, methodology, and data collection instruments is important. The guardians signed the informed consent form voluntarily, expressing their approval for their children to be part of the pedagogical experience. This ethical process ensures that educational intervention is carried out under principles of respect, responsibility, and transparency.

LINK: GR_7_LCaro_VHernández_ASalamanca

The instrument validation format is designed to receive and include the opinion of an expert on the relevance, coherence, and sufficiency of a data collection instrument in the framework of the project "Integration of CLIL with Science through the implementation of a project focused on the Butterfly Cycle". This document includes a brief introduction where the objective of the project and the instrument are stated, followed by a table with validation criteria that the expert must evaluate on a four-level scale: "Does not comply", "Partially acceptable, requires modifications", "Satisfactory, minimal adjustments are required", and "Excellent, no modifications required". The criteria evaluated are the instrument's consistency with the project's objectives, precision in the wording of its components, and its sufficiency with respect to the established purpose. In addition, a space is provided for recommendations for adjustments and experts.

VIGILADA MINEDUCACIÓN - SNIES 1704

Results.

The master's students propose these instruments to identify the type of learning style with which the students, to whom the thesis project will be directed, feel most comfortable.

The first one is Vak Test, the theoretical framework considered was the one established by Cazau (2004), which defines a learning style as the cognitive, affective, and physiological traits that help identify how students perceive and respond to a learning environment. In this way, three types of learning styles are established: kinesthetic, visual, and auditory.

For this study, the VAK test was used as an instrument to identify students' learning styles. Based on these results, a differentiated strategy is introduced within the CLIL (Content and Language Integrated Learning) method. According to Özdemir et al. (2022), personalized learning and the use of innovative teaching strategies offer the potential to improve students' academic performance and motivation. Likewise, Pérez-Pérez and Castro (2024) emphasize that teacher education in differentiated instruction is key to personalizing teaching according to students' individual needs.

The second instrument is a Conducting interview with teachers in bilingual environments who implement the CLIL (Content and Language Integrated Learning) methodology, which is essential for understanding and improving educational practice. These interviews allow for the exploration of teachers' perceptions, experiences, and needs, facilitating a more effective implementation of the CLIL approach.

VIGILADA MINEDUCACIÓN - SNIES 1704

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VIGILADA MINEDUCACIÓN - SNIES 1704

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VIGILADA MINEDUCACIÓN - SNIES 1704

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Results

Instrument 1.

Laura Juliana Caro, Valentina Hernández, and Andrea Salamanca proposed this instrument to identify the type of learning style with which the students to whom the degree project will be directed feel more comfortable. The reference framework considered was the one established by Cazau (2004) in which a learning style is defined as the cognitive, affective, and physiological traits that allow identifying how students perceive and respond to a learning environment. Thus, three types of learning are established: kinesthetic, visual, and auditory.

For this study, the VAK test was used as an instrument to identify students' learning styles, and based on these results, which introduced a differentiated strategy in the CLIL (Content and Language Integrated Learning) method. According to Özdemir et al. (2022), personalization of learning and the use of innovative teaching strategies offer the ability to improve students' academic performance and motivation. Similarly, Pérez-Pérez and Castro (2024) emphasize that educating teachers in differentiated instruction is the key to personalizing instruction to the

VIGILADA MINEDUCACIÓN - SNIES 1704

individual needs of students.

A diagnosis was made using the VAK test, which allowed the choice of learning activities adapted to the learning preferences of the students, who preferred their understanding and participation in the educational process. The use of the VAK test in CLIL methodology is based on how important it is to know how students learn to improve content and language learning at the same time. Özdemir et al. (2022) emphasize the need to match individual student characteristics to individual student characteristics, while Pérez-Pérez and Castro (2024) show that teachers who receive training in differentiated instruction can implement more effective instructional practices. In this context, the VAK test received permission to adjust instructions in the CLIL method, which facilitates the integration of visual, auditory, and kinesthetic techniques according to students' desires, supporting more meaningful and effective learning.

From the information collected, it is expected to guide the activities that will be part of the didactic unit that will use the CLIL methodology as an approach to teach the life cycle of the butterfly *Leptophobia aripa* in English as a foreign language. With reference to the question format, the Vark learning styles test was consulted, since, according to García (2007), this test makes it possible to detect the sensory experiences that facilitate students' learning, giving them a leading role in the teaching-learning process. In addition, this instrument makes it possible to present situations typical of the student's daily life in a language that is comfortable for them.

The CLIL (Content and Language Integrated Learning) model has become the leading methodology in second language teaching, as it allows students to learn disciplinary content through the development of language skills. To maximize its effectiveness, it is important to identify students' learning styles, and VAK (visual, auditory, and kinesthetic) tests reflect a

VIGILADA MINEDUCACIÓN - SNIES 1704

suitable tool for this purpose. Previous studies have shown that identifying these styles allows you to customize more efficient educational strategies (Silva et al., 2019).

With respect to the special characteristics that were taken into consideration when choosing an instrument to collect information from third-grade students of a private institution, which is the population selected to develop the above-mentioned degree project, it is necessary to present a child-friendly instrument that investigates the qualities that an environment that facilitates their learning should have. In this way, when the methodological design is proposed, the results of this instrument will be considered in the planning of the activities, and consequently, the students will gain protagonism in their learning process.

It was also considered that the VAK test makes it possible to address the sensory mechanisms that favor learning, Gaviria, and Rodriguez (2004), within the framework of a metacognitive exercise that seeks to investigate the way we learn. Considering that learning in humans represents different complexities, and that according to the experience of the teachers who guide the Spanish language in the group of students that will address this degree project, they are at a level of literal reading comprehension, the statements were proposed to enable the representation in children of situations that are part of their daily lives to facilitate their understanding.

In addition, studies have shown that most students in the educational environment respond differently to visual, auditory, and kinesthetic stimuli, which influences their ability to acquire foreign language information processing and disciplinary concepts at the same time, it is important to determine their learning desires to avoid cognitive overload and promote deep understanding. Finally, the VAK test is a real tool for CLIL research as it provides quantitative.

VIGILADA MINEDUCACIÓN - SNIES 1704

information on how students process information and allow for more personalized learning strategies. A recent study on the use of the VAK model in language learning revealed that students who were taught according to their learning styles showed better results in oral sense and production (Fernandez et al., 2022). Therefore, the integration of this tool in CLIL studies would not only help improve students' academic performance but would also provide a more inclusive and effective approach to teaching in another language.

Finally, the Likert scale was also considered since it is qualitative in nature and has been widely used in social perception studies by Castillo, (2020). It was also considered a friendly scale for students ranging from 8 to 10 years old. Below, you will be presented with several statements related to learning about the life cycle of an organism. Please read each statement carefully and mark with an “X” the box that best represents your knowledge: i.e., agree or disagree with each statement. Use the following scale to respond:

1. Strongly disagree.
2. Disagree.
3. Neither agree nor disagree.
4. Agree.
5. Strongly agree.

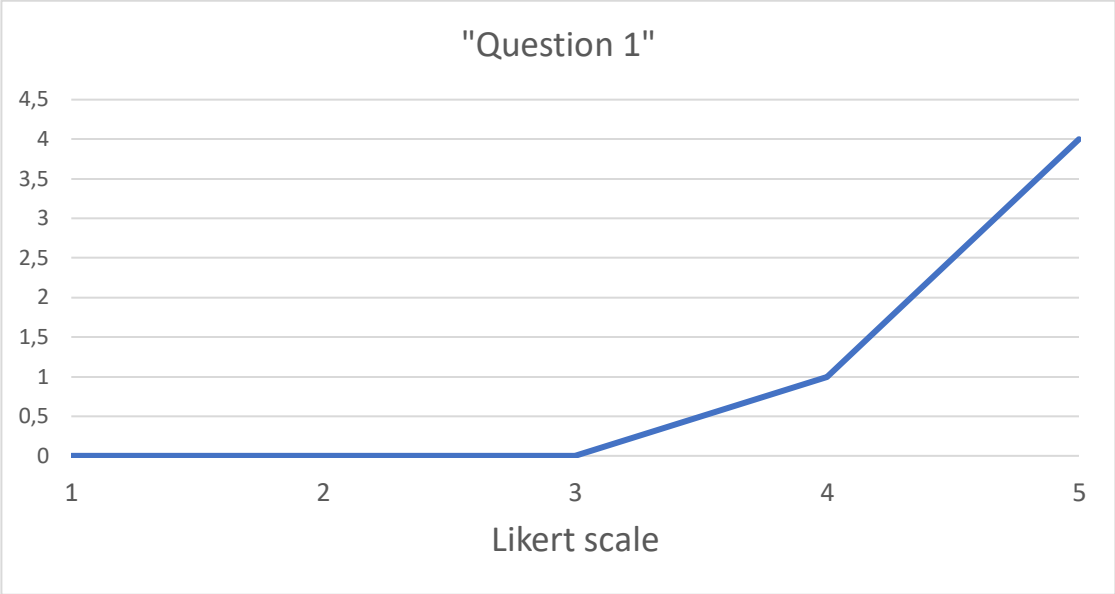
1. When I need to learn the main structures of a living being, I prefer to

   A. Relate structures to images.

1.	2.	3.	4:1	5: 4

VIGILADA MINEDUCACIÓN - SNIES 1704

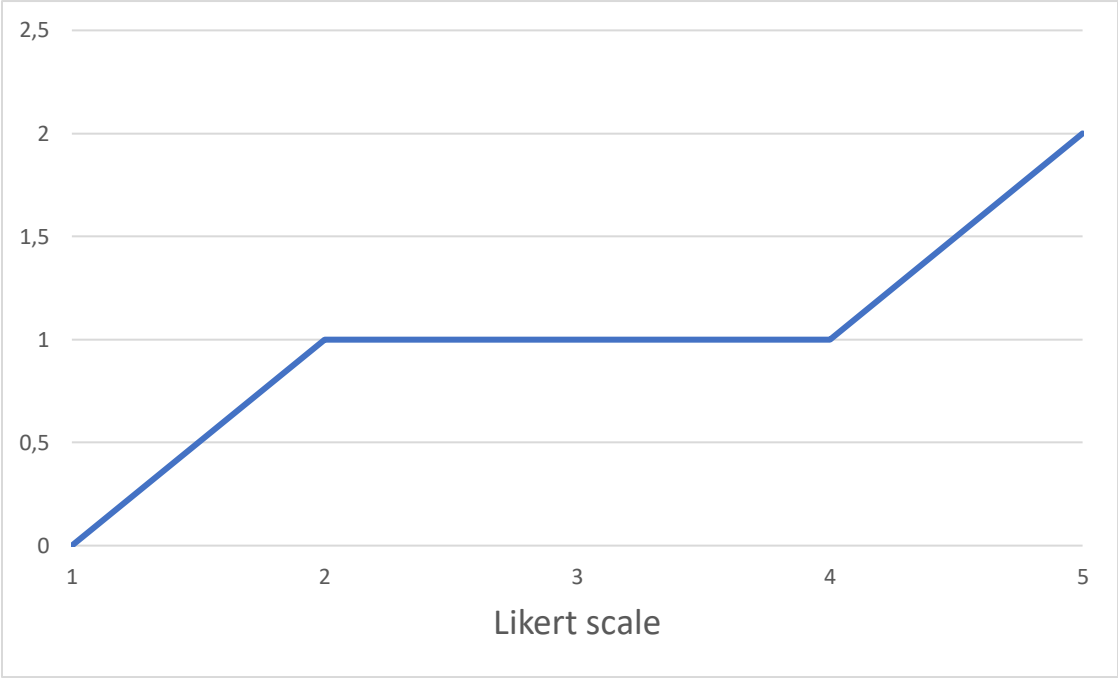
Graph 1: Linear graph of the first question, Vak test instrument.



B) Read a story where the structures of the organism are related to its function.

1	2:1	3:1	4:1	5: 2

Graph 2: Linear graph of the second question, Vak test instrument.

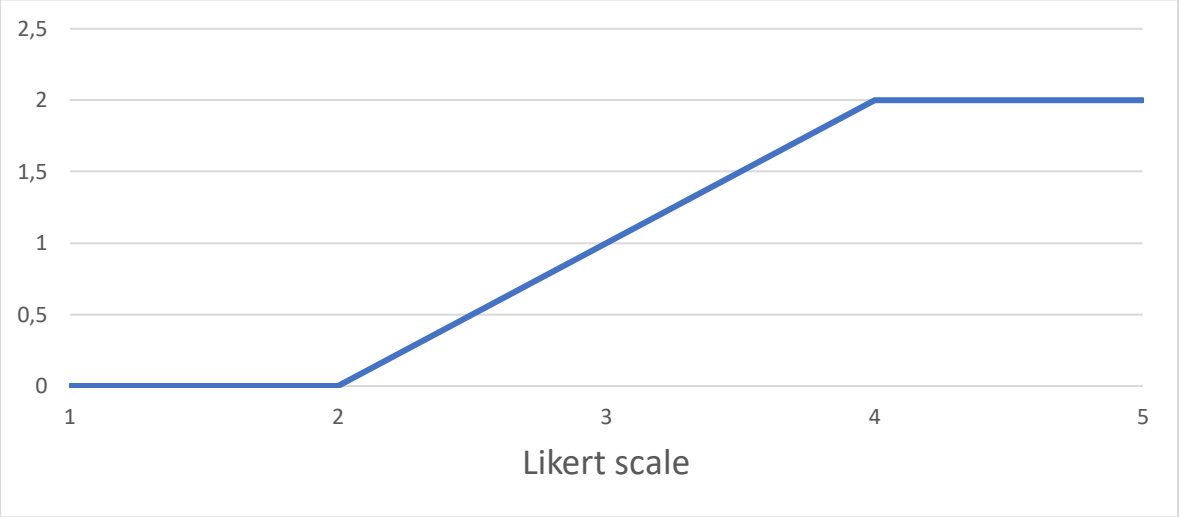


VIGILADA MINEDUCACIÓN - SNIES 1704

c) Listen to a podcast where an expert talks about the main structures of the living being.

1	2:	3:1	4:2	5: 2

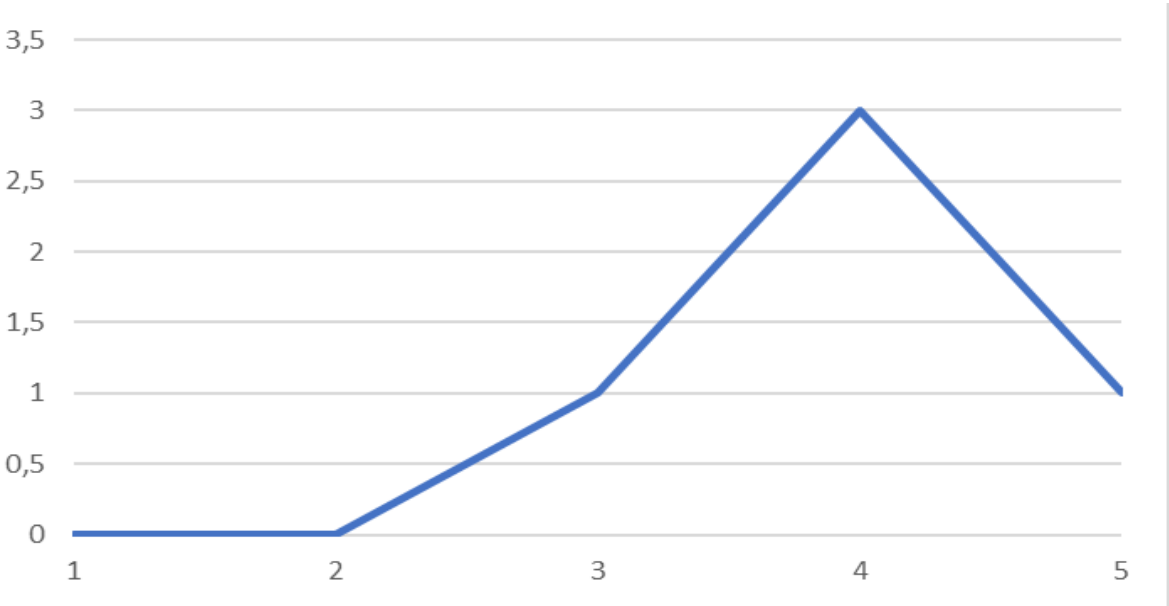
Graph 3: Linear graph results of the first question, VAK test instrument



2. If I were assigned the task of evaluating the growth of two plants of the same species, in which the light conditions were changed for each one, I would prefer to present the results:
A) Take photos of the two plants and exhibit them to my classmates.

1	2:	3:1	4:3	5: 1

Graph 4: Linear graph results of the second question, VAK test instrument.

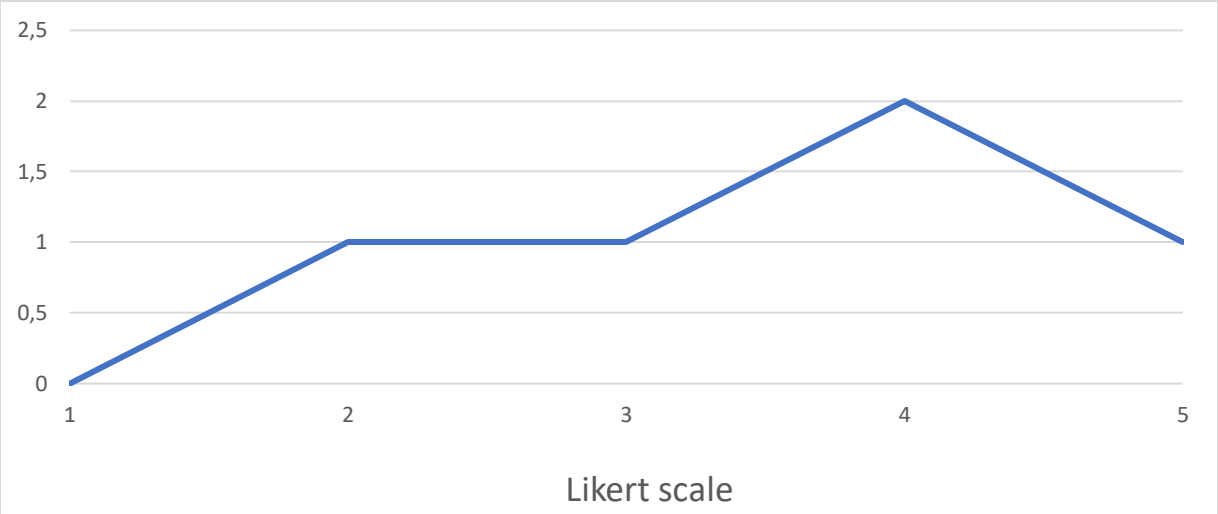


VIGILADA MINEDUCACIÓN - SNIES 1704

B. Organize information about the plants into graphs and describe to my classmates the growth of each plant.

1	2:1	3:1	4:2	5: 1

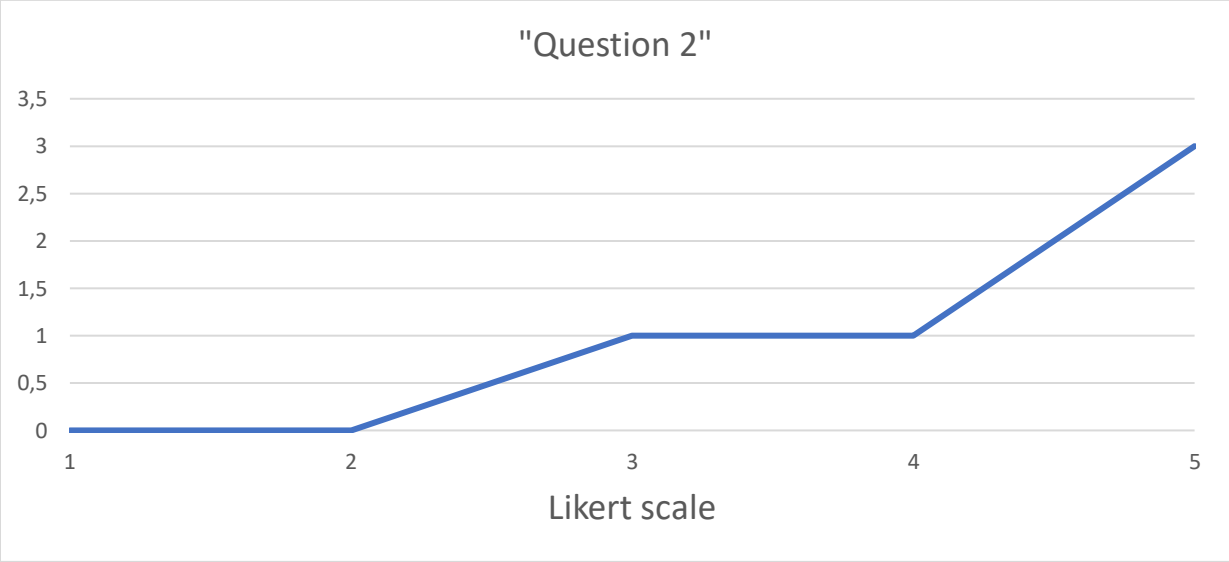
Graph 5: Linear graph results of the second question, Vak test instrument.



C Bring the two plants to school and describe to my classmates how the growth process of each one went.

1	2:	3:1	4:1	5: 3

Graph 6: Linear question results of the second question, Vak test instrument.



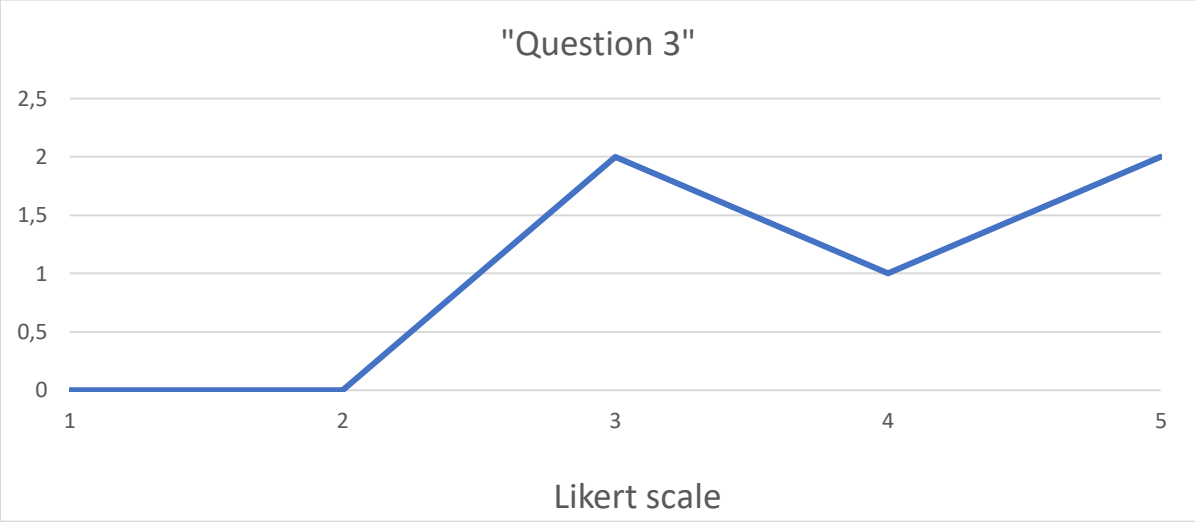
VIGILADA MINEDUCACIÓN - SNIES 1704

3. What activity do I enjoy the most when learning something new about an animal?

A. View photographs of the most striking structures of the animal to draw them.

1	2:	3:2	4:1	5: 2

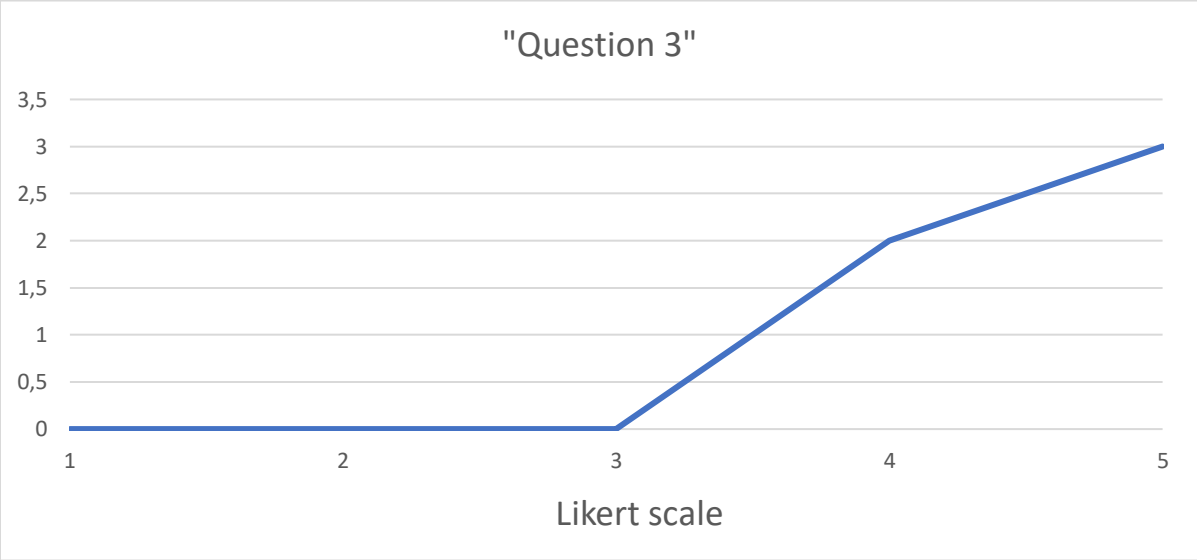
Graph 7: Linear graph results of the third question, Vak test instrument.



B) Listening to videos with curious facts about animals.

1.	2.	3.	4:2	5:3

Graph 8: Linear graph results of the third question, Vak test instrument.

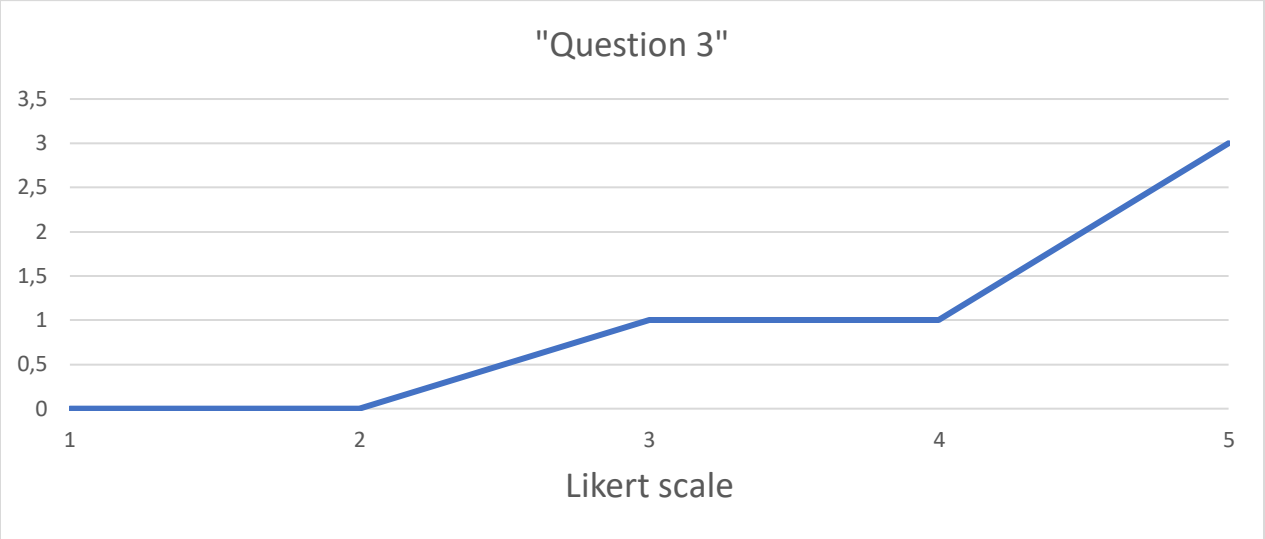


VIGILADA MINEDUCACIÓN - SNIES 1704

C Choosing an animal to care for from its early stages to adulthood.

1.	2.	3:1	4:1	5.3

Graph 9: Linear graph results of the third question, Vak test instrument.

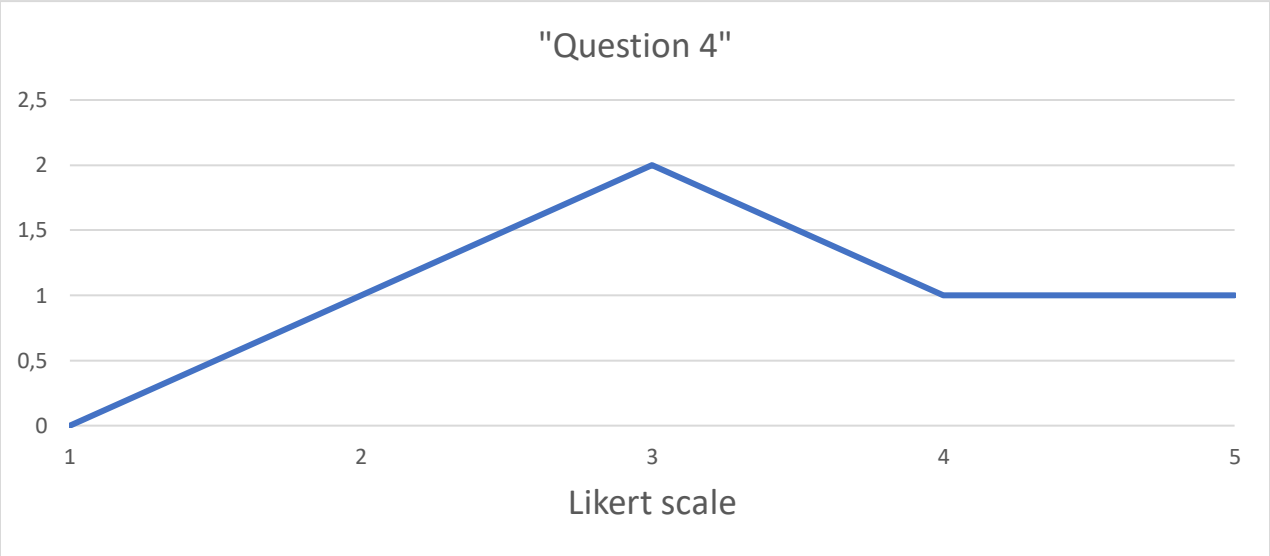


4)Which of the following activities do I find most appealing in experimental work?

A. Observing organisms under the microscope.

1.	2:1	3:2	4:1	5:1

Graph 10: Linear graph results of the fourth question, Vak test instrument.

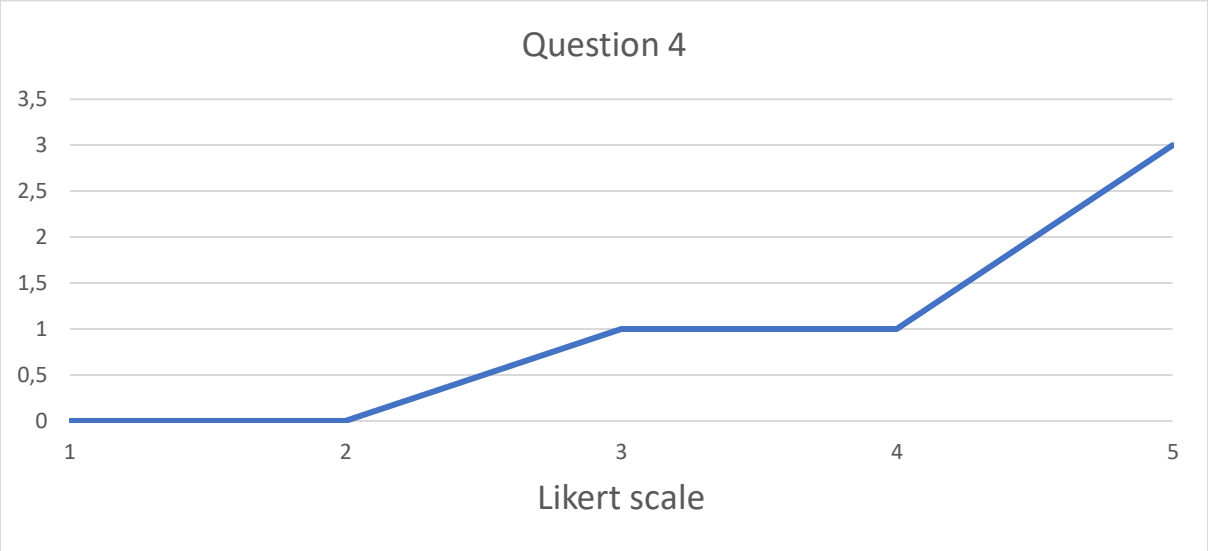


VIGILADA MINEDUCACIÓN - SNIES 1704

B. Follow group procedures to create a product such as ice cream or soap.

1.	2.	3:1	4:1	5:3

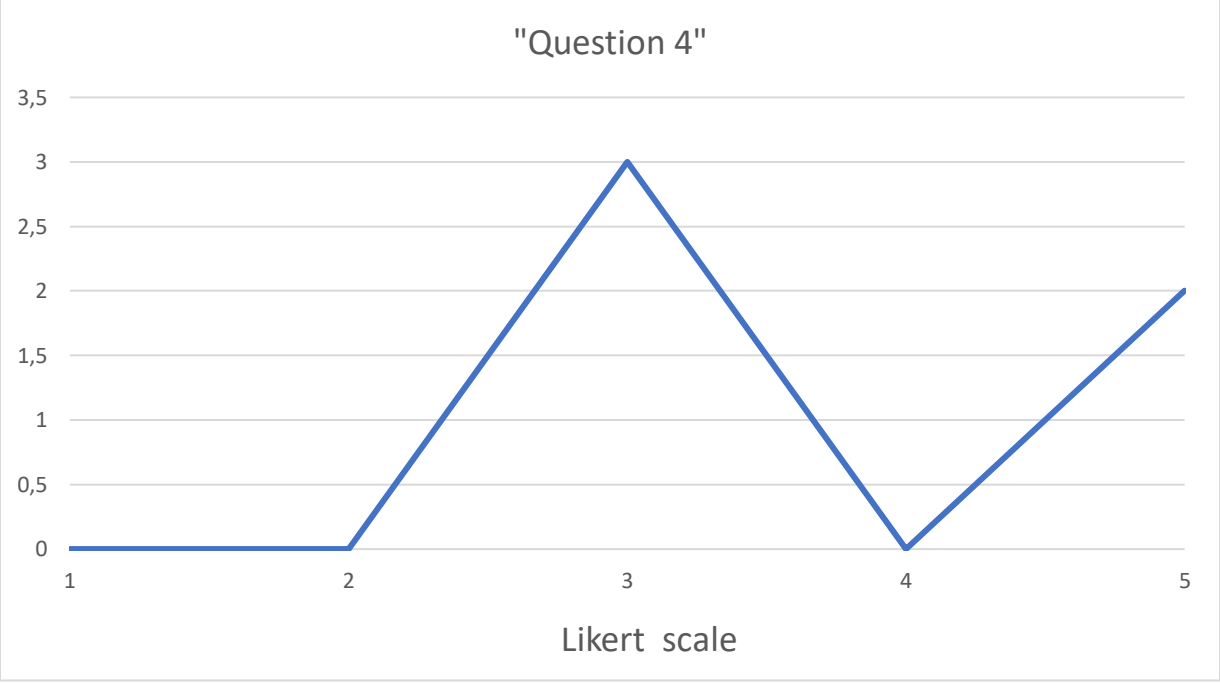
Graph 11: Linear graph results of the fourth question, Vak test instrument



C. Follow a procedure to develop an artifact in which the concepts learned are applied.

1.	2.	3:3	4.	5:2

Graph 12: Linear graph results of the fourth question, Vak test instrument



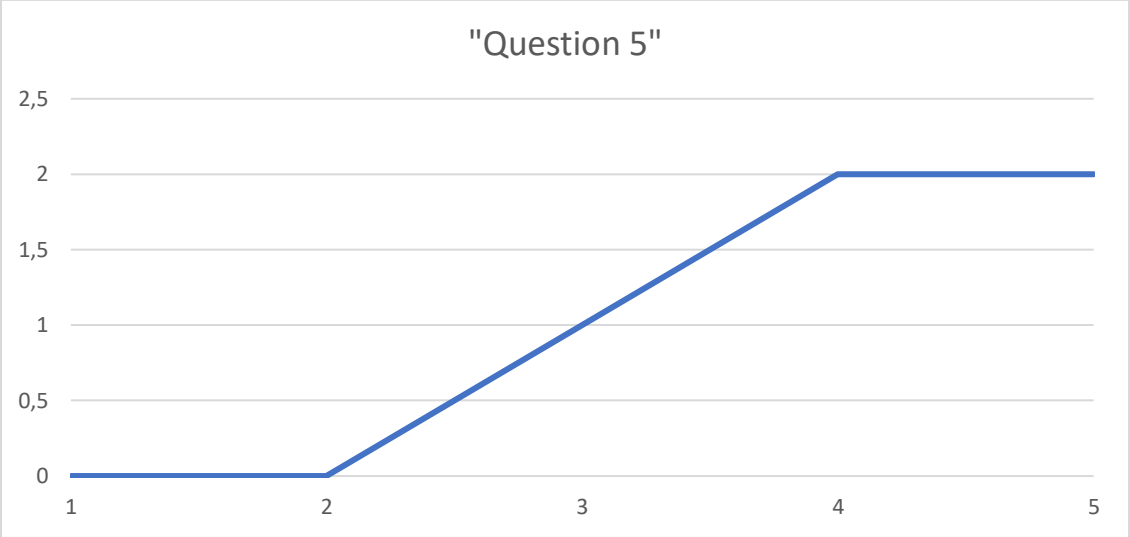
VIGILADA MINEDUCACIÓN - SNIES 1704

5. If a foreign person came to your city and asked you to show them a particular animal, what is the first thing you would do?

A. Look for photographs of the animal in its habitat.

1.	2.	3:1	4:2	5:2

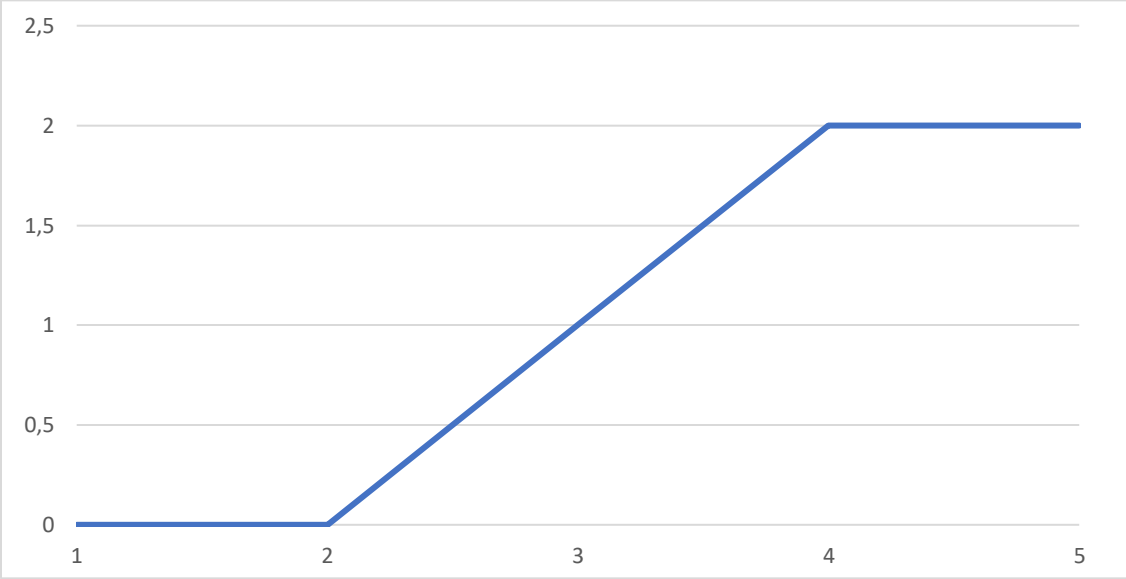
Graph 13: Linear graph, results of the fifth question, Vak test instrument



B. Send videos where the importance of the animal in each context is exposed.

1.	2.	3:1	4:2	5:2

Graph 14: Linear graph, results of the fifth question Vak test instrument.

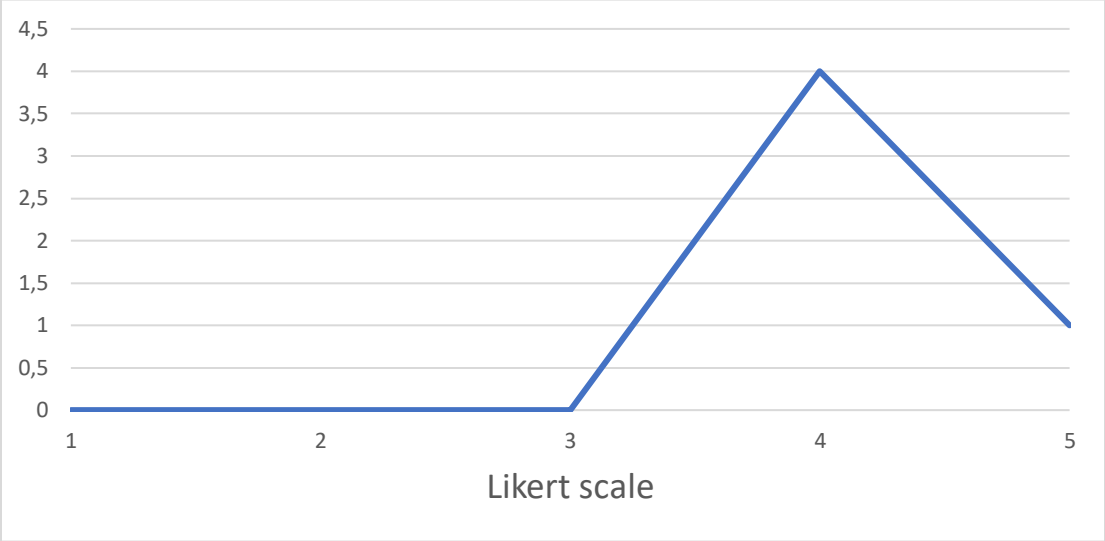


VIGILADA MINEDUCACIÓN - SNIES 1704

C. Send you plans in which you can see this animal in its natural habitat.

1.	2.	3.	4:4	5:1

Graph 15: Linear graph, results of the fifth question, Vak test instrument

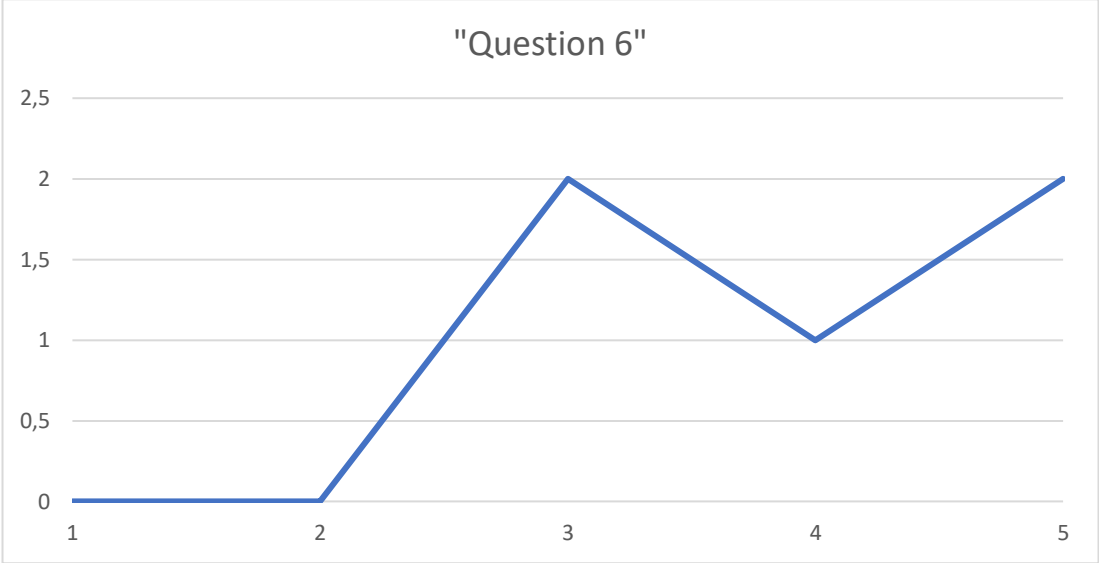


6 If you were assigned the task of writing a text describing your favorite animal, how would you present it?

A. Present images of the animal, highlighting its characteristics.

1.	2.	3:2	4:1	5:2

Graph 16: Linear graph, results of the sixth question, Vak test instrument

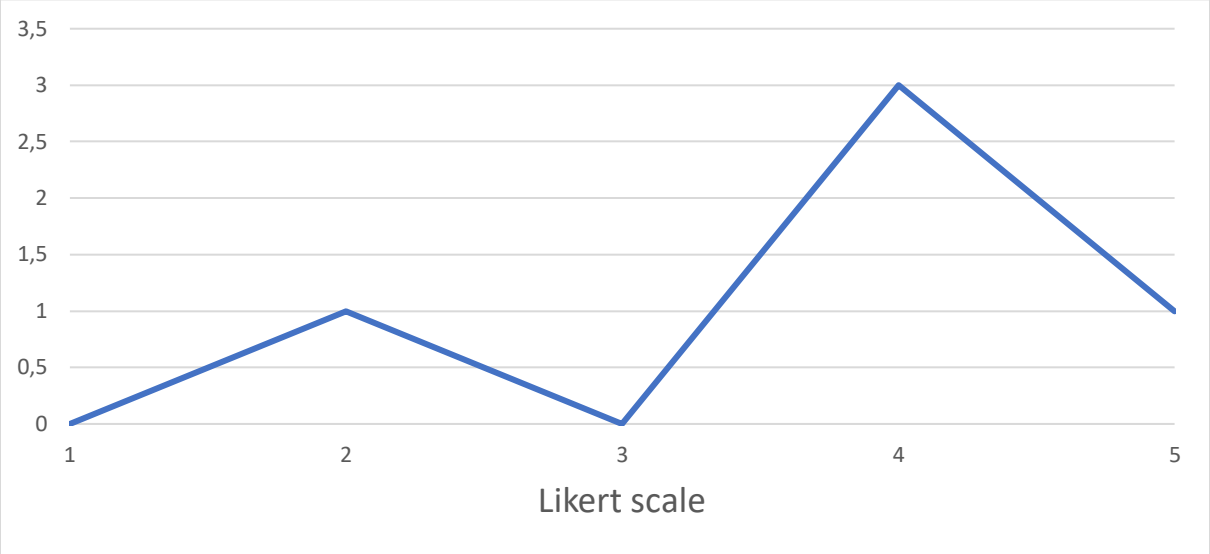


VIGILADA MINEDUCACIÓN - SNIES 1704

B. Record a video describing the animal's fun facts.

1.	2:1	3.	4:3	5:1

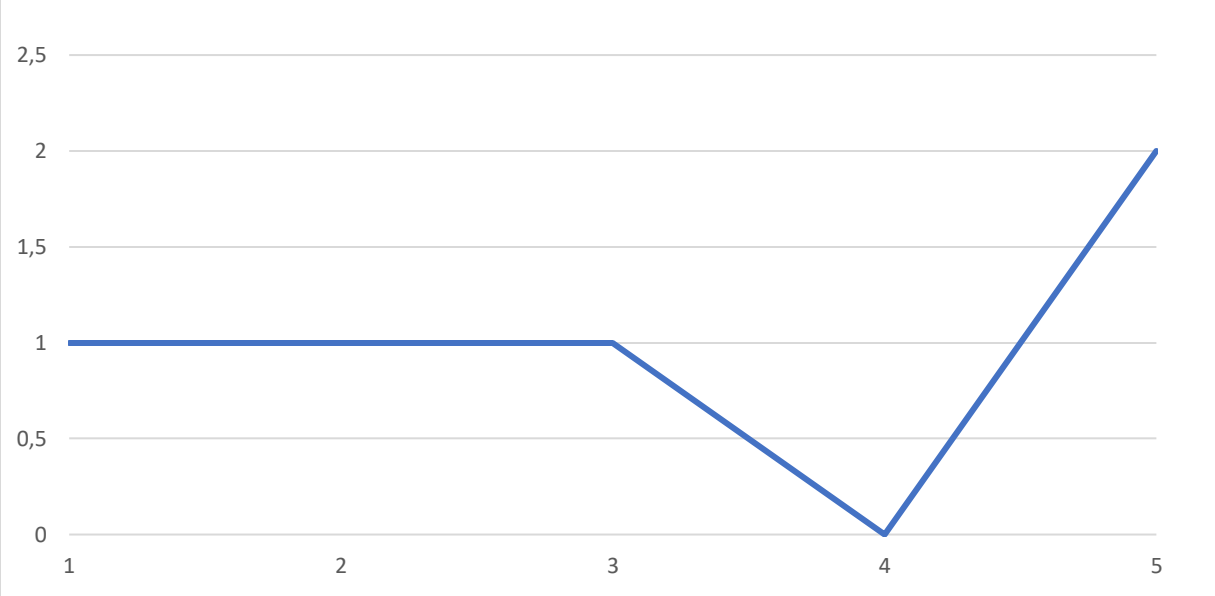
Graph 17: Linear graph results of the sixth question Vak test instrument



C. Use a custom of the animal to describe its main characteristics.

1:1	2:1	3:1	4.	5:2

Graph 18: Linear graph, results of the sixth question, Vak test instrument

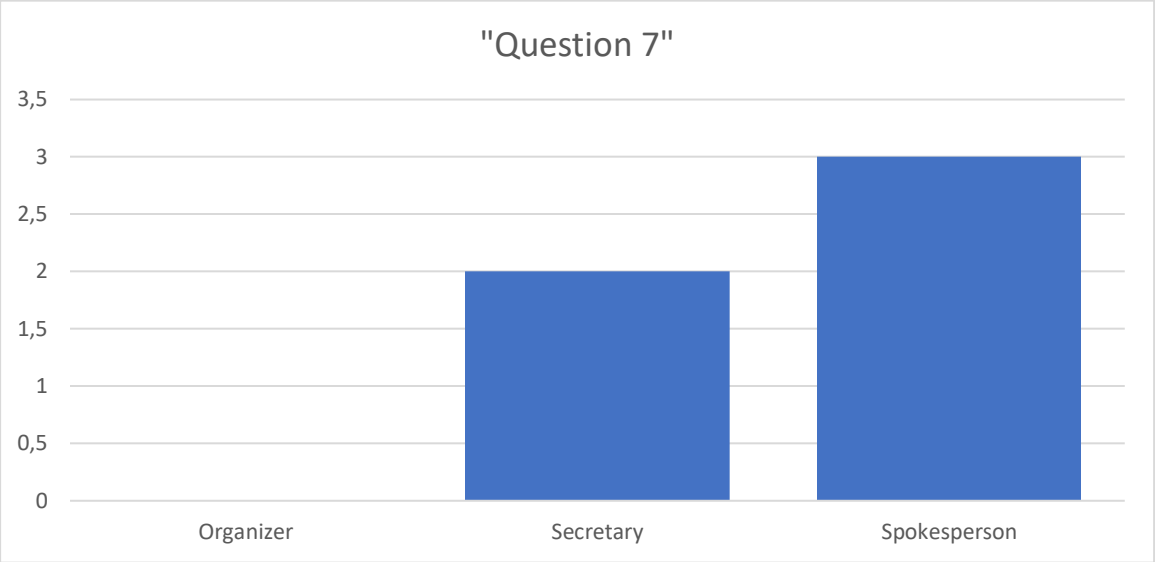


VIGILADA MINEDUCACIÓN - SNIES 1704

7)When assigned to work in a team, which of the following roles am I most comfortable with?

A Secretary or rapporteur: records information and organizes the team's ideas.
B Spokesperson: Share the team's views
C Organizer: delegate small tasks to follow the steps of a procedure

Graph 19: Bar graph: results of the seventh question, first instrument.



Quantitative Analysis

According to Johnson (2011), this quantitative analysis is conducted within a descriptive approach, as its objectivity and ability to reveal the situation as it is—without any interpretation—allow for the identification of the mode, which represents the data point with the highest frequency.

The descriptive approach seeks to specify the properties, characteristics, and essential features of any phenomenon under analysis (Faneite, 2023).

The approach proposed by Hernández-Sampieri, R., & Mendoza, C. (2020) was considered in the development of this analysis, as he states that closed-ended questions with response options suggested by the interviewer require the identification of trends. In this regard, based on the results obtained from the first instrument, the following graphs were developed.

VIGILADA MINEDUCACIÓN - SNIES 1704

Quantitative data analysis relies on data collection and statistical procedures to identify patterns and interests within a given population. (Hernandez, Baptista, 2023)

Linear Graph: This tool was used considering that each option presented to the students in the instrument was oriented toward a specific type of learning.

Therefore, by identifying the peaks where most students tended to align, it was possible to design activities specifically targeting this type of neurolinguistic programming.

According to the results of the first instrument, it was possible to determine that options 1 and 2 showed the lowest frequency, indicating a lower preference for the activity. However, these options increased frequently in those activities that involved reading and writing exercises. Regarding options 4 and 5, it was found that most students showed interest in observing the life cycle of an organism through all its stages. Moreover, when they were assigned the role of teaching, all five students chose to use videos and images. Finally, the bar chart corresponding to the last question reveals that none of the participants wished to assume the role of reporter; instead, they preferred to delegate tasks or share the group's opinion orally.

Instrument 2.

Design and results:

Main objectives:

- To assess proficiency in both languages (listening, speaking, reading, and writing).
- Identify the dominant language and in which situations they use each language.
- Detect possible language difficulties that may affect their learning in other areas (e.g., reading comprehension problems that impact math or science).

VIGILADA MINEDUCACIÓN - SNIES 1704

- Explore the student's attitude and confidence with both languages (whether they feel anxious, prefer one over the other, etc.).
- Understand their linguistic environment (what language is spoken at home, with friends, at school).
- Design appropriate pedagogical strategies, such as additional language support or differentiated materials.

Profile of the interviewees:

The interviewees were two teachers in natural sciences in charge of the students who are part of this study; they will be called “Teacher 1” and “Teacher 2”.

Teacher profile and preparation:

These questions provide insight into the teacher's professional profile, which is key to understanding their readiness to meet the challenges of the CLIL approach. According to Coyle, Hood, and Marsh (2010), a solid foundation in bilingual education is a determining factor in the effective implementation of CLIL. In addition, they explore the teacher's level of familiarity with integrated approaches. Previous experiences influence the willingness to adopt innovative methodologies such as CLIL.

1. What is your academic background and experience in teaching in bilingual environments?

Teacher 1: Bachelor's degree in Spanish and Classical Philology.

Teacher 2: 6 years of experience as an English and Science teacher

2. Have you had previous experience with methodologies that integrate content and language learning?

VIGILADA MINEDUCACIÓN - SNIES 1704

Teacher 1: No.

Teacher 2: My first experience was at the institution where I currently work.

Perception and preparation for CLIL.

The next block of questions allows us to identify the teacher's understanding of the fundamental principles of CLIL. Coyle et al. (2010) emphasize the integration of the 4 Cs (Content, Communication, Cognition, Culture) as the core of the approach. It also makes it possible to anticipate specific resistances or difficulties. According to Badurina (2023), teachers often anticipate challenges such as a lack of training, language proficiency or curriculum adaptation.

3. What aspects do you consider important when implementing a methodology that combines content and foreign language learning?

Teacher 1: It is necessary to consider the context of the students, as well as their particularities, with the approach to English as a foreign language.

Teacher 2: The didactics of the learning area being taught, along with the points of convergence between English as a foreign language and the area to be taught in this language.

4 What challenges do you anticipate in implementing CLIL in your classroom?

Teacher 1: Students' lack of confidence in expressing their answers in another language.

Teacher 2: The technical vocabulary specific to each subject area.

Strategies and resources.

The following three questions seek to identify professional development needs. Ongoing training is essential in CLIL, as Mehisto, Marsh and Frigols (2008) point out, since many teachers have not been trained specifically in this methodology, but also to investigate perceptions about pedagogical resources, which are fundamental in CLIL. Dalton-Puffer et al.

VIGILADA MINEDUCACIÓN - SNIES 1704

(2010) argue that materials should be designed to support both content and linguistic development, and this can be more easily found by revealing the teacher's ability to apply differentiated strategies, which is key in CLIL, where linguistic scaffolding is required to facilitate learning (Coyle et al., 2010)

5. What kind of support or training do you consider necessary to effectively implement the CLIL methodology in your classroom?

Teacher 1: Technological resources and teacher training.

Teacher 2: Digital resources, as well as spaces in which teachers of the CLIL areas and English teachers create proposals for transversality between the areas.

6. What kind of materials or resources do you think would be necessary to apply CLIL effectively?

Teacher 1: Attractive resources that consider gamification and artificial intelligence.

Teacher 2: Digital resources that enable the exploration of English-speaking cultures.

7. What strategies would you use to support students who may have language difficulties during class?

Teacher 1: Use the modeling of instructions to confirm understanding.

Teacher 2: The application of thinking routines that enable metacognitive exercises in which the student expresses the way in which he/she is most comfortable learning something new.

Evaluation and follow-up.

The next set of questions explores current assessment practices. In CLIL, dual assessment (content and language) is an essential component (Linares, Morton & Whittaker, 2012) but it also

VIGILADA MINEDUCACIÓN - SNIES 1704

provides insight into the teacher's view of new forms of integrative assessment. Mehisto et al. (2008) indicate that assessment in CLIL should be holistic, considering content, language, and critical thinking.

8. How do you assess your students' progress in both content learning and language development?

Teacher 1: I consider the guidelines and rubrics established in English.

Teacher 2: I consider the English language area competencies established at the institution, in addition to the basic learning rights and national guidelines for the natural sciences, and the Common European Framework for assessing students' English language skills.

9. How do you think students' progress could be evaluated in a CLIL environment?

Teacher 1: Considering the 4 Cs together with Bloom's taxonomy.

Teacher 2: Considering the higher and lower order skills that, according to the CLIL methodology, are established as HOTS and LOTS.

Perspective and expectations.

The last question focuses on the perceived benefits of the approach. Lasagabaster and Sierra (2010) show that CLIL can increase motivation by contextualizing language in meaningful content and inquire about external factors that affect implementation. The literature (Wolff, 2009) points out that institutional support, planning times, and adequate materials are key to the success of CLIL.

VIGILADA MINEDUCACIÓN - SNIES 1704

10. How do you think CLIL could impact student learning and motivation?

Teacher 1: By offering them a holistic perspective of English.

Teacher 2: By exposing them to a strategy that enables them to understand English as a tool for learning new skills in different fields of knowledge.

11. What institutional support or additional resources do you think would be necessary to facilitate the implementation of this methodology in your educational context?

Teacher 1: Give more time to the development of certain concepts to give them greater depth, considering their complexity.

Teacher 2: I would like to receive training in this methodology along with resources to develop activities specific to the area of knowledge being taught.

Validation of the instrument.

Name of expert:

Lara Bonilla

Professional Role: Bachelor's in philosophy and arts, and a master's in education.

Laura Bonilla is a philosophy educator with a strong background in social sciences and pedagogy. Holds a B.A. in Philosophy and Languages and a master's in education. Brings twelve years of experience teaching English and Philosophy. Skilled in critical thinking, educational planning, and interdisciplinary teaching. Currently, she works as a PTA teacher for the Secretariat of Education in Ibagué and as a lecturer at Universidad de Ibagué.

VIGILADA MINEDUCACIÓN - SNIES 1704

Name of the expert who validates the instrument:

David Enrique Paris Bermeo

Professional role

Teacher of master's degree in Bilingual Learning Environments - U. Santo Tomás.

Teacher of master's degree in Pan-Hispanic Linguistics - U. de la Sabana.

David París, Experienced language educator with a strong background in teaching Spanish and English as foreign and second languages. Skilled in team leadership, teacher training, instructional design, content creation, gamification, and academic writing. B.A. in Philology and languages with an emphasis in English and a master's in teaching Spanish as a foreign language and a second language. Currently working on two master's degrees in bilingual learning environments and pan-Islamic linguistics. Published author with experience in higher education and language programs.

Instrument 3.

Main objectives:

The main objectives of the instrument entitled "Diagnostic Survey for Parents" of the project "Integration of CLIL with Science through the implementation of a project focused on the Butterfly Cycle" are the following:

Diagnose the level of students' interest and motivation towards topics related to nature, science, and the use of English in the school context.

Evaluate the student's level of English proficiency as perceived by parents, as well as their previous experience in science or environmental projects.

Identify resources available at home that can support the development of the project, including physical materials and internet access.

VIGILADA MINEDUCACIÓN - SNIES 1704

Know the level of family support available, in terms of the willingness and frequency with which parents can accompany the student's academic activities.

To gather parents' expectations and recommendations regarding the implementation of a project that integrates science and English language learning, in order to adapt the pedagogical approach to the realities of the context.

This tool seeks to facilitate contextualized and inclusive educational planning, favoring the success of the CLIL approach in the classroom through active collaboration between family and school.

Profile of interviewees:

Parents or guardians of elementary school students, specifically of a group that will participate in the project “Integration of CLIL with Science through the implementation of a project focused on the Butterfly Cycle”.

The participation of families is a crucial factor for the success of this type of project, especially in bilingual educational contexts. According to Escobar Alméciga and Gómez Sará (2020), parents play an essential role in the motivation and academic performance of students, since their support at home reinforces what is learned in the classroom. School-family collaboration favors inclusive education that respects students' cultural and linguistic differences, promoting a positive and equitable learning environment.

This survey aims to gather key information about the academic needs of their children, the resources available at home, and the parents' expectations of the project. From this information, we will be able to adapt the pedagogical approach to the characteristics and contexts of the

VIGILADA MINEDUCACIÓN - SNIES 1704

students, ensuring that everyone has the best opportunities to learn and develop in a bilingual environment.

The diagnostic survey for parents is composed of a series of questions designed to gather relevant information about the academic, linguistic, and family context of the students. These questions address topics such as the students' interest in nature and science projects, their level of understanding and motivation towards the English language, as well as the frequency with which they receive homework support. In addition, we inquired about the resources available at home that can facilitate the development of the project, the parents' willingness to get involved in complementary activities, and their expectations regarding the integration of English and science in the educational process. Finally, an open space is provided for parents to share recommendations or special aspects that they consider important for the success of the project.

How much interest does your child show in nature or animal topics?

Has your child participated in school science or environmental projects before?

How would you rate your child's level of English comprehension?

How motivated does your child feel to use English in school activities?

How often can you support your child in Science or English assignments?

What resources do you have available at home to support the project? Would you like your child to participate in projects that integrate English and science?

Are you willing to support your child in activities that complement the project (e.g., conducting small investigations, building models, etc.)?

VIGILADA MINEDUCACIÓN - SNIES 1704

What expectations do you have for a project that integrates Science and English language learning?

Are there any recommendations or special aspects you would like to share for the development of the project?

Validation of the instrument.

Name of the expert who validates the instrument:

Olga Jeanet Moreno Sandoval

Professional role

Bachelor's degree in biology

Biology graduate with more than 20 years of experience in teaching natural sciences at the elementary, middle and high school levels. Throughout her career she has demonstrated a strong commitment to the integral formation of students, promoting critical thinking, environmental awareness, and meaningful learning. For 5 years she has successfully held the position of academic coordinator in educational institutions, leading processes of curriculum planning, teacher support, implementation of innovative pedagogical strategies, and institutional evaluation. She has solid skills in educational management, conflict resolution, teamwork, and leadership, oriented to the continuous improvement of academic quality.

Name of the expert who validates the instrument:

Isela Fuentes Arias

Professional role:

Master's in Digital Resources Applied to Education, UniCartagena

VIGILADA MINEDUCACIÓN - SNIES 1704

Bachelor's degree in biology with a master's degree in digital resources Applied to Education from the University of Cartagena. Professional with solid scientific and pedagogical training, committed to educational innovation and improvement of teaching-learning processes around natural sciences. She has experience in the integration of digital technologies in the classroom, the design of virtual learning environments, and the implementation of teaching strategies to encourage the active participation of students and autonomous learning. She stands out for her ability to adapt scientific content to different educational contexts, promoting an inclusive, meaningful, and contextualized education.

Results:

The survey was answered by parents and is focused on aspects related to their children's interest in science, level of English, motivation, support at home and their expectations for an integrative project. The following is a general interpretation of the results based on the answers.

VIGILADA MINEDUCACIÓN - SNIES 1704

Chart #3 Instrument 3 Results

Analysis of responses for each question	
How much interest does your child show in nature or animal topics?	A high level of interest prevails, which is a good starting point for linking the project to science and environmental issues.
Has your child participated in school science or environmental projects before?	Most responded "yes" or "maybe", indicating relevant prior experience.
How would you rate your child's level of English comprehension?	Most of them are in the low to medium range, which means adapting the language of the project.
How motivated does your child feel when using English in school activities?	Regular motivation predominates, although there are high and low responses. Need to design more dynamic and participatory activities.
How often can you support your child in Science or English homework?	Mainly "sometimes", which requires not relying too much on the family environment to achieve project objectives.
What resources do you have available at home to support the project? Would you like your child to participate in projects that integrate English and science?	Internet access is widespread, which favors research tasks, content visualization and digital work.
Are you willing to support your child in complementary project activities (e.g., conducting small investigations, building models, etc.)?	All indicated partial willingness. Ideally, flexible activities should be proposed that can be adjusted to different levels of involvement.
What are your expectations for a project that integrates science and English language learning?	Parents expect reinforcement of science and language skills, development of creativity and effective communication in English.
Are there any recommendations or special aspects you would like to share for the development of the project?	Concerns about academic load, respect for children's rights and handling of oral presentation situations are highlighted.

Interest in nature or animal topics

Prevalence of high interest: Most indicated that their children show quite a lot or a lot of interest in nature and animals.

Previous participation in school science or environmental projects

Most have participated or possibly participated in such projects, indicating familiarity with the interdisciplinary approach.

VIGILADA MINEDUCACIÓN - SNIES 1704

English comprehension level

Predominance of low and medium levels, suggesting that the English component should be carefully adapted to the level of the students to avoid frustration.

Motivation to use English.

Varies from regular motivation to very motivated, although there are cases of low motivation. This indicates that activities should be engaging and contextualized to increase interest.

Support at home for homework

Most parents indicate that they can support "sometimes", which reflects limitations possibly due to time or knowledge, but with some willingness.

Resources available at home

Internet access is present in all homes, which is positive for the development of complementary activities or research at home.

Willingness to support the project.

All expressed a willingness to be partially supportive, suggesting that simple or collaborative family tasks can be assigned.

Project Expectations

In general, parents expect their children to:

Reinforce science and language skills.

Enhance creativity.

Improve English comprehension.

Communicate ideas in both areas.

Recommendations or special aspects

VIGILADA MINEDUCACIÓN - SNIES 1704

Several families express:

Concerns about academic load.

Need for respect for learning rights and rhythms.

Suggestions to avoid activities that expose their children in public if they do not feel comfortable.

Pedagogical Implementation

The present pedagogical implementation is framed within the principles of the Content and Language Integrated Learning (CLIL) approach, which proposes a simultaneous integration between the learning of disciplinary content and the development of linguistic competences in a foreign language. This proposal will be carried out in the context of a classroom project focused on the study of the life cycle of the butterfly, articulating the area of Natural Sciences with the learning of English as a foreign language (EFL). The design responds to the contemporary challenges of bilingual education, which demand pedagogical practices that promote meaningful, transversal and contextualized learning (Mehisto, Marsh, & Frigols, 2021).

The CLIL approach, according to Lo and Lin (2021), enables students to build disciplinary knowledge while developing communicative skills in English, promoting dual and meaningful learning. This approach posits the need to employ scaffolding strategies to support the comprehension and production of academic language in scientific contexts. Consequently, a primer will be designed in which the use of English language will be integrated with key concepts of biology, favoring the active participation of teachers and students in tasks of observation, recording, and analysis of real natural phenomena (Lo & Lin, 2021).

VIGILADA MINEDUCACIÓN - SNIES 1704

The purposes guiding this implementation were the following:

To integrate the CLIL approach in an interdisciplinary project focused on the life cycle of the butterfly.

To develop scientific, communicative, and citizenship skills through learning experiences based on direct observation and collaborative work.

To evaluate the impact of this integration on the development of cognitive, linguistic, and attitudinal skills in elementary school students.

To promote environmental awareness and understanding of biological processes through the use of foreign language as a learning medium (Tang, 2021).

The methodological proposal focuses on the development of a pedagogical booklet as the main artifact, which will function as a guide for the teacher and the student in the development of the project on the life cycle of the butterfly. This booklet will include scientific contents structured in a didactic way, with emphasis on the vocabulary in foreign language (English), as well as theoretical and experiential activities designed to facilitate experiential and meaningful learning (Mehisto et al., 2021).

The purpose of the booklet is to provide practical tools that allow teachers to implement the CLIL approach in the classroom, integrating the learning of English with the development of scientific competencies. The proposed activities include:

Guided readings with illustrated key vocabulary.

Direct observations of the metamorphosis process.

Writing and description exercises in English.

Experiences of inquiry and experimentation with the natural environment.

VIGILADA MINEDUCACIÓN - SNIES 1704

Collaborative projects and playful activities that reinforce the use of language in authentic contexts (Lo & Lin, 2021; Mehisto et al., 2021).

The primer, therefore, is constituted not only as a didactic resource but also as an instrument of methodological articulation, allowing scientific content and linguistic development to be integrated coherently and functionally.

The collection of information is based on a participatory and multi-source approach, aimed at gathering qualitative and quantitative inputs to nurture the design, validation, and improvement of pedagogical primers. To this end, instruments will be applied to teachers, parents, and students to learn about their perceptions, needs, and experiences regarding the learning of the butterfly cycle and the implementation of the CLIL approach (Lo & Lin, 2021).

The instruments considered included:

Semi-structured interviews with teachers to identify strategies employed, challenges, and needs in the bilingual teaching of natural sciences.

Surveys of parents focused on home support and perceptions about their children's learning.

Questionnaires applied to students, to assess the appropriation and enjoyment of the content of the different topics covered in science and the use of English in meaningful contexts (Tang, 2021).

This data will be systematized and analyzed to provide feedback for the development of the booklet, ensuring its relevance, applicability, and alignment with the real needs of the educational context.

VIGILADA MINEDUCACIÓN - SNIES 1704

The construction of a pedagogical primer based on the CLIL approach represents an innovative strategy to integrate the learning of natural sciences and foreign languages from an experiential and meaningful perspective. By focusing on the life cycle of the butterfly, it takes advantage of tangible content that is close to the student's environment, which allows establishing connections between scientific knowledge, language development, and environmental awareness (Mehisto et al., 2021; Tang, 2021).

The implementation of this proposal contemplates the active participation of teachers, families, and students as key agents in the information gathering process, which contributes to guarantee the relevance of the designed resource. This pedagogical experience demonstrates how the principles of the CLIL approach can be materialized in concrete tools that strengthen interdisciplinary teaching and integral learning in basic education (Lo & Lin, 2021; Mehisto et al., 2021).

VIGILADA MINEDUCACIÓN - SNIES 1704

Chart # 4

Pedagogical chart components.

Approach synthesis including citation	Number of sessions, lessons, or classes.	Synthesize the participants' description.	Name and number of pedagogical activities including the link to evidence the design.
The pedagogical implementation is framed within the Content and Language Integrated Learning (CLIL) approach, which promotes simultaneous acquisition of content knowledge and foreign language skills (Lo & Lin, 2021; Mehisto et al., 2021). The project integrates English as a Foreign Language (EFL) and Natural Science through the study of the butterfly life cycle. Scaffolding	A total of 3 sessions, each lasting approximately 60 minutes. Sessions will be distributed over a 3-week period, with 1 session per week.	The participants will include a group of 13 primary school students. The students are in a bilingual private school in Bogotá Colombia.	Based on the director's suggestions and the progress of the implementation, the researchers will include the information and complete the table. The elaboration of the primer (which will include different activities) will start once approved, and the table will be fed with the information.

VIGILADA MINEDUCACIÓN - SNIES 1704

strategies and experiential learning are key to this approach.			
The information presented in this table may be subject to change since we will be attentive to the different corrections of the director and the disposition of the educational actors involved, as well as the schedule of activities arranged by the institution.			

ANALYSIS OF RESULTS.

The analysis of results focused on evaluating the impact of the pedagogical project based on the CLIL methodology on the learning of natural sciences, the development of English as a foreign language (EFL), and civic competencies in primary school students. To this end, data was collected through classroom observations, surveys administered to students and teachers, and semi-structured interviews. The results obtained show significant progress in the understanding of the scientific content covered, as well as greater participation and use of English in academic contexts. The main findings are presented below, organized according to the categories of analysis: science learning, language development, citizenship skills, and teacher perception.

PARTICIPANT'S EXPECTATIONS.

Analysis of the three instruments reveals strong synergy between the levels of motivation and expectations of students, teachers, and parents regarding an integrative project combining science and English. The quantitative results of Instrument 1 show that students feel more motivated when they participate in collaborative, authentic, and meaningful activities. This coincides with recent research that has documented significant

VIGILADA MINEDUCACIÓN - SNIES 1704

increases in motivation and creativity through active methodologies such as project-based learning (PBL), both in science and languages (Pangestu et al, 2024); and in English contexts, where more than 90% of students preferred PBL over traditional methods, describing the activities as “interesting,” “enjoyable,” and “fun.”

From the teaching perspective (Instrument 2), the implementation of methodologies such as CLIL is perceived as a valuable strategy for promoting integrated content and language learning, although its effectiveness depends on factors such as the intensity and quality of implementation. A study in Sweden showed that the development of academic vocabulary in English was significantly higher in contexts where CLIL was well implemented, with institutional support and a balance in the use of languages (Olsson, 2021). Similarly, recent research indicates that combining CLIL with 21st-century skills, such as Knowmad skills, increases student motivation in higher education (Muñoz Benito, Rodríguez Zapatero, Pérez Naranjo, & Morilla García, 2020). In line with this, Nevia (2024) showed that in university management contexts, the use of CLIL increased student participation from less than 50% to more than 85% in two teaching cycles, confirming its transformative potential.

Finally, the expectations expressed by families (Instrument 3) reflect a clear desire for students to develop both cognitive and communicative skills, which supports the active and contextualized learning approach. Although recent studies on parental involvement do not specifically address the integration of science and English, they do highlight the crucial role of family participation, along with other factors such as student motivation and

VIGILADA MINEDUCACIÓN - SNIES 1704

academic interest, in educational success (Hill, 2022; Rumbaoa et al., 2022). This suggests that family collaboration reinforces the motivational effects observed in students and teachers, thus consolidating an environment conducive to innovative educational programs.

RESOURCES REQUIRED FOR PROJECT IMPLEMENTATION.

The analysis shows that students benefit significantly from resources that allow them to learn actively and experiment, especially in contexts where a physical laboratory is not available. A recent example is the use of home laboratory kits during the pandemic, which included practical devices accompanied by strategies such as creating videos or blogs, which improved their academic performance, motivation, and self-efficacy (Álvarez Ariza, 2022). These types of tangible resources, which students can manipulate in their everyday environment, are essential for promoting meaningful participation in science and language learning through authentic experiences.

From a teaching perspective, the implementation of approaches such as CLIL requires not only appropriate materials but also structured institutional support. According to a recent study, 81% of teachers agreed that they needed new teaching materials aligned with the CLIL approach to ensure its success, as well as administrative support and peer collaboration to facilitate its management and adaptation (Redalyc study, 2021). In other words, the resources required by teachers include not only relevant physical or digital resources, but also training, administrative support, and opportunities for professional cooperation.

VIGILADA MINEDUCACIÓN - SNIES 1704

In the family environment, the necessary resources transcend the material and include skills, emotional support, and organizational structures in the home environment. Programs such as HIPPY, which train parents to guide educational activities at home through specific training, strengthen parental self-efficacy and encourage the availability of educational materials in the home (Frontiers, 2023). Furthermore, research suggests that when families have organized educational home environments, with appropriate routines and spaces, they can sustain more effective and motivating learning practices for students (PMC study, 2022). This implies that family resources include both tangible elements (materials, spaces) and intangible elements (training, emotional and organizational structure).

CLIL METHODOLOGY

According to Hernández-Sampieri & Mendoza (2020) model, we have made an axial codification from the mixed methodology, with the aim of "bringing together" the pieces of information that the results of each instrument can provide us with and reducing the complexity of understanding the phenomenon.

VIGILADA MINEDUCACIÓN - SNIES 1704

Chart. Axial codification for the CLIL category.

Central category	Associated codes	Description.
Students' expectations	Enthusiasm, curiosity, oral insecurity.	Reflects positive motivation, although with challenges in oral expression.
Teachers' perspective	Lack of materials, need for training, time for preparation	Shows resources and support required for CLIL implementation.
Family role	Limited support, willingness to collaborate, need for guidance	Reveals the importance of family involvement to consolidate learning.

Chart. Axial codification for the CLIL category.

The results obtained show that the group of students has mostly a low or intermediate level of English, which implies a starting point that requires differentiated strategies within the implementation of CLIL. Although the initial language level may limit fluency in oral production, the CLIL methodology, by integrating content and foreign language learning, offers the possibility of developing skills gradually, promoting meaningful exposure to the language in authentic contexts. The motivation reported by students when working in English, although variable, suggests that it is necessary to reinforce motivational strategies, especially those that incorporate attractive and gamified resources, in line with teachers' suggestions.

VIGILADA MINEDUCACIÓN - SNIES 1704

The agreement between parents and teachers on the importance of strengthening both natural sciences and English reflects a school context that is receptive to the implementation of CLIL. However, teachers identify significant challenges, such as students' lack of confidence in expressing themselves in another language and the complexity of the technical vocabulary of the subjects, which is in line with the challenges documented in the literature on CLIL. Likewise, the need for specific teacher training and technological resources that allow for cross-curricular integration is highlighted, including materials that integrate gamification and the use of artificial intelligence tools, as well as the cultural exploration of English-speaking contexts.

The strategies mentioned to support students with difficulties, such as modeling instructions, thinking routines, and metacognitive exercises, are in line with CLIL best practices to ensure comprehension and promote autonomy in learning. In terms of assessment, teachers propose clear reference frameworks, including national guidelines, institutional competencies, and international standards such as the Common European Framework, while also integrating Coyle's 4Cs and Bloom's taxonomy, which demonstrates an understanding of the holistic assessment required by this methodology. Finally, the perception that CLIL can provide a holistic view of English and turn it into a tool for interdisciplinary learning reinforces its motivational and educational potential, provided that it is accompanied by adequate planning, resources, and training for its effective implementation.

VIGILADA MINEDUCACIÓN - SNIES 1704

The implementation of the CLIL methodology in the context analyzed presents significant potential for the simultaneous development of English language skills and disciplinary knowledge in natural sciences. The data indicate that, although students start at low or intermediate levels in English, there is a positive attitude toward integrated learning, supported by the motivation of families and the interest of teachers. However, confidence in expressing oneself in another language and the acquisition of technical vocabulary are consolidated as the main challenges, confirming the need for explicit linguistic scaffolding.

Likewise, teachers have an initial understanding of the principles of CLIL, including the importance of context, cross-curricularity, and comprehensive assessment that considers both content and language. The reference to the 4Cs and Bloom's taxonomy shows an alignment with recognized theoretical frameworks, which facilitates the projection of more structured pedagogical practices. However, for CLIL to achieve its maximum impact, it will be essential to provide teachers with specific training, relevant technological resources, and teaching materials that respond to the diversity of learning styles.

VIGILADA MINEDUCACIÓN - SNIES 1704

LACK OF CONTEXTUALIZATION OF INTERDISCIPLINARITY.

The findings show that, although there is a clear intention on the part of teachers and families to strengthen both natural science and English learning, there is still a lack of contextualization in interdisciplinary design, which limits the effectiveness of the CLIL methodology. Contextualization, understood as the adaptation of content and tasks to the cultural, social, and linguistic realities of the student body, is an essential element in ensuring that interdisciplinarity is not reduced to the juxtaposition of knowledge, but rather becomes an integrated and meaningful learning experience (Coyle, Hood, & Marsh, 2010). The absence of this component causes content to be presented in a fragmented way, increasing the cognitive load and reducing opportunities for knowledge transfer between areas (Nikitina, 2002).

Teachers recognize the importance of considering the context of students and the didactics of each discipline when planning integrated activities, but the responses indicate that these considerations rarely translate into concrete pedagogical proposals. This gap between discourse and practice is consistent with previous studies, which warn of the tendency to implement CLIL without situated planning, resulting in difficulties such as lack of confidence in expressing oneself in another language, overload of technical vocabulary, and decreased student motivation (Drake & Reid, 2018; Nikitina, 2002). Likewise, assessment tends to focus on general language and content standards, without incorporating criteria that explicitly measure the integration between both dimensions or

VIGILADA MINEDUCACIÓN - SNIES 1704

their contextual relevance (Coyle et al., 2010).

The literature indicates that to remedy this shortcoming, it is essential to have a curriculum design that is based on topics relevant to the school community and that allows for the natural integration of content and language (Drake & Reid, 2018). Co-planning between English teachers and subject teachers, together with the use of context-adapted language scaffolding strategies, is a cornerstone of effective interdisciplinarity (Coyle et al., 2010). The use of digital and gamified resources, provided they are anchored in issues and realities close to the students, can promote both motivation and learning retention (Nikitina, 2002). Similarly, the incorporation of authentic tasks and integrated assessments that consider Coyle's 4Cs and Bloom's taxonomy would help to strengthen the link between content learning and language development (Coyle et al., 2010).

In this sense, teacher training emerges as an essential requirement for moving toward a contextualized implementation of CLIL. Training programs that address situated interdisciplinary planning, the use of scaffolding strategies, and the design of culturally relevant materials would enable teachers to transform their theoretical knowledge into concrete and sustainable practices (Drake & Reid, 2018). This approach would not only promote the simultaneous acquisition of content and language skills but would also consolidate students' intrinsic motivation by helping them perceive the relevance of what they have learned to their immediate environment and prospects.

VIGILADA MINEDUCACIÓN - SNIES 1704

This analysis was conducted under the category Teaching and Learning English*, to evaluate four instruments designed for the project "Integration of CLIL with Science through the implementation of a project focused on the Butterfly Cycle." These instruments—the VAK Test to identify learning styles, interviews with teachers in bilingual contexts, and a diagnostic survey of parents and teachers—seek to gather key information for implementing the CLIL approach in a contextualized, inclusive, and effective manner.

The assessment was carried out considering criteria such as pedagogical relevance, internal consistency, contextualization, validity and reliability, potential impact, and evaluation mechanisms. The analysis shows that the instruments are solidly grounded, respond to the linguistic and cultural needs of students, and integrate the participation of the entire educational community. However, it also points to the need to define more precise indicators to measure progress in English language skills. The results obtained provide a basis for guiding the planning of strategies that strengthen integrated content and language learning in a bilingual school context.

VIGILADA MINEDUCACIÓN - SNIES 1704

Analysis criteria	Indicators	Significant findings
Pedagogical relevance	- The tool responds to real needs in English language learning. - It adapts to students' levels and contexts. - It integrates content and language (CLIL).	The four tools (VAK Test, interviews, and surveys) are aligned with the goal of integrating science and English, based on a real assessment of learning styles, teacher perceptions, and family context.
Internal consistency	- Relationship between objectives, methodology, and results. - Consistency in the use of references and theoretical foundations.	There is consistency between the theoretical basis and the design of instruments. The bibliographical references are recent (2020-2025) and relevant to CLIL and differentiated learning.
Contextualization	- Adaptation to students' English level. - Consideration of sociocultural factors. - Inclusion of the voice of the educational community.	Is recognized that the level of English is low-medium, which guides linguistic scaffolding strategies. Perceptions of families and teachers are incorporated to strengthen cultural and social relevance.
Validity and reliability	- Validation by experts with experience in bilingual education. - Clarity and precision in the questions.	All instruments were reviewed by experts in CLIL, language teaching, and elementary school education to ensure relevance and clarity.
Potential impact	- Ability to generate improvements in motivation and language skills. - Use of active and contextualized strategies.	Personalization based on the VAK Test and the integration of gamification, thinking routines, and practical activities promote meaningful and motivating English learning.
Evaluation and monitoring	- Existence of mechanisms to measure progress in English and content. - Clarity in progress indicators.	Although there is reference to dual assessment (content and language), specific indicators and tools for monitoring linguistic progress throughout the project need to be detailed.

VIGILADA MINEDUCACIÓN - SNIES 1704

Findings

- Comprehensive diagnosis through data triangulation (students, teachers, and families).
- Active participation of the educational community, strengthening sustainability and sense of belonging.
- Cultural and linguistic adaptation to avoid frustration and promote inclusion.
- Need for more specific linguistic indicators.
- Potential for replication in other bilingual educational contexts.
- Student motivation is enhanced by active and personalized methodologies.

The analysis of the four instruments used—VAK Test, teacher interviews, and diagnostic survey of parents—shows that the project is based on a comprehensive diagnosis that considers the needs, perceptions, and resources of key actors in the educational process. This triangulation of information strengthens the relevance and effectiveness of the proposal, ensuring that the CLIL approach is implemented in a contextualized manner and aligned with the students' level of English and sociocultural characteristics.

FINDINGS AND DISCUSSION

The following is a detailed presentation of the research findings and their discussion in relation to the theoretical basis and the school context analyzed. Given that the CLIL booklet on the butterfly life cycle has been designed but not yet implemented in the classroom, the results correspond to the process of diagnosis and construction of the pedagogical proposal, as well as the projection of its future applicability.

VIGILADA MINEDUCACIÓN - SNIES 1704

Findings from the institutional diagnosis

The context analysis identified a series of issues that justify the creation of a pedagogical tool such as the designed booklet. Among the most relevant is the fragmentation between the objectives of the bilingual curriculum and science teaching practices in the school context. Teachers, despite having training in foreign languages, expressed limitations in the design and implementation of experimental scientific experiences. This creates a conflict between what the institution proposes in its model and the real opportunities for meaningful learning for students.

The literature supports this finding. Banegas, Poole, and Corrales (2020) show that "in Latin America, CLIL faces a scenario of limited resources and uneven teacher preparation, which hinders its impact on science teaching." In the context of this study, the teachers interviewed specifically mentioned the difficulty of planning and implementing practices, which translates into an excessive emphasis on theoretical content and the memorization of concepts, leaving aside meaningful experiential and practical learning.

The workbook proposal responds to this finding by offering a structured and accessible resource that guides teachers step by step in integrating scientific and linguistic activities, even if they do not have specialized training in science.

Diversity of learning styles

The VAK test administered to students revealed the coexistence of visual, auditory, and kinesthetic learning styles. This result confirms that the group is not homogeneous in terms of cognitive preferences and that, therefore, teaching must take pedagogical differentiation into account.

VIGILADA MINEDUCACIÓN - SNIES 1704

The designed booklet incorporates strategies that cater to these styles:

For visual learners, illustrations, diagrams, and charts of the butterfly life cycle are included.

For auditory learners, it includes read-alouds, videos, and activities that reinforce this perception.

For kinesthetic learners, it includes activities involving direct observation, experimentation, and dramatization of the stages of the life cycle.

This approach is consistent with that proposed by Özdemir et al. (2022), who emphasize that "personalization in CLIL environments improves motivation and academic performance by offering multiple ways to access knowledge."

Furthermore, catering to learning styles is particularly relevant in a context where several students have Individualized Accommodation Plans (IAPs). Decree 1421 of 2017 establishes the obligation to "guarantee methodological adjustments that allow for the full participation of students with disabilities or special educational needs." By providing for flexible and differentiated activities, the booklet is a tool that is aligned with these regulatory provisions.

Perceptions of teachers and families

Teachers

The teachers interviewed expressed a positive attitude toward the innovation represented by CLIL, recognizing that it can generate more meaningful learning by integrating science and English in authentic contexts. However, they also identified structural limitations:

VIGILADA MINEDUCACIÓN - SNIES 1704

Lack of training in natural sciences.

Shortage of materials adapted to the bilingual approach.

Difficulty balancing time between language and content teaching.

These aspects reflect the findings of Olsson (2021), who argues that “the effectiveness of CLIL depends on the availability of resources and institutional support.” Teachers do not reject the methodology but express the need for greater preparation and support.

In this sense, the booklet serves not only as a resource for students but also as a guide for teachers, offering clear guidance on how to approach scientific content in English in a practical and accessible way.

Families

The parents surveyed expressed a high level of interest in proposals that integrate science and English, considering that they add value to their children's education. They recognized the potential of bilingual projects to expand academic and social opportunities.

However, they also expressed concerns about academic overload and the need to respect individual learning rhythms. This tension is consistent with Hill (2022), who warns that “family participation is essential for the sustainability of bilingual projects, but it must be accompanied by a balanced design that avoids student overload.”

The booklet addresses this concern by proposing short, clear, and contextualized activities that seek to consolidate meaningful learning. In addition, it is designed as a resource that can also be used at home, strengthening the shared responsibility of school and family in the educational

VIGILADA MINEDUCACIÓN - SNIES 1704

process.

Educational inclusion

One of the most relevant findings is the need to address diversity in the classroom. In the group assessed, several students have special educational needs, which require the incorporation of reasonable adjustments in teaching.

The revision of Colombian regulations (MEN, 2017) confirms that educational institutions are required to guarantee equity in access to and retention in school through methodological and evaluative adaptations. Within this framework, the booklet was designed with flexible activities that can be adjusted to each student's level, promoting and respecting inclusion processes.

This finding coincides with Hernández (2023), who states that "teacher training in CLIL should include inclusive strategies that respond to diversity." The primer not only promotes bilingualism and science education, but also constitutes a tool for inclusive education, insofar as it considers the heterogeneity of the group.

Projection:

Based on the findings, it is possible to discuss the relevance of the booklet and its projection in educational practice.

Firstly, the proposal responds to a real need in the context: the absence of integrated materials that facilitate the teaching of science in English. The booklet offers teachers a structured resource that can be used immediately, reducing their dependence on their disciplinary training.

Secondly, by integrating differentiated activities, the workbook caters to diverse learning styles

VIGILADA MINEDUCACIÓN - SNIES 1704

and inclusion needs, making it a resource that is aligned with the principles of equity.

Thirdly, the participation of families in the assessment confirms that the resource should not only be used at school, but should also extend to the home, allowing for continuity of learning in family contexts.

Finally, the literature review shows that "the effectiveness of CLIL does not depend solely on materials, but also on institutional conditions and teacher training" (Mehisto, Marsh & Frigols, 2021). Therefore, the primer should be understood as a first step in a broader process that requires institutional support and training programs.

In summary, the discussion suggests that the booklet has great potential as a pedagogical resource, but that its impact will depend on factors such as teacher willingness, family involvement, and institutional support.

Conclusions

The CLIL booklet, designed around the butterfly life cycle, responds to needs identified in the school context, related to the lack of materials, diversity of learning styles, and educational inclusion.

Although it has not yet been implemented, the design process is based on solid findings that allow us to anticipate its relevance and potential impact.

The proposal is aligned with the CLIL theoretical framework and Colombian regulations on inclusion and reflects the importance of coordination between school and family.

VIGILADA MINEDUCACIÓN - SNIES 1704

The sustainability of the initiative will depend on institutional support and teacher training in inclusive CLIL strategies.

CONTRIBUTION TO THE BILINGUAL LEARNING ENVIRONMENTS.

The holistic perspective proposes approaching knowledge from the theory of complexity, Solano S. (2023)8, which responds in some way to the contributions that can be made to bilingual learning environments, considering that many aspects affect a person's learning, and there are many theories on the subject. Therefore, as part of our work as teachers, we have developed a proposal that seeks to teach from the context to which the students belong, since the school is located near a butterfly-shaped urban development.

Around this urban development project, residents have organized grassroots initiatives that have led to the creation of groups promoting cultural and educational activities aimed at improving the well-being of the community. In this vein, a point of convergence was sought between the teaching of natural sciences and a cultural component of the environment in which the project is to be implemented. This approach follows the CLIL methodology, which, according to Dack, T. M. F., Argudo, J., & Abad, M. (2020)1, is an alternative that combines the teaching of a field of knowledge with the process of learning a second language. Consequently, a bilingual learning environment must consider culture as a fundamental axis in the expressions and appropriation of language that are constructed communally and are part of its sociolinguistic dimension.

In this vein, the contribution that we intend to make as master's students in a Colombian context must consider cultural diversity as a predominant aspect. ABAs transcend the

VIGILADA MINEDUCACIÓN - SNIES 1704

school as a formal institution since learning can take place in different environments. From this perspective, the history of a neighborhood that is part of the students' environment could enable the development of values such as a sense of belonging to a place that is part of the students' daily lives and where they carry out most of their activities during the day.

On the other hand, the approaches proposed by Rodríguez, S.M. (2021) give special importance to the development of emotional skills as a contribution to bilingual learning environments. It is clear how emotionality is part of our lives and affects our learning processes. The affection and closeness that exist between people allow relationships to be built that facilitate our comprehensive education. In my view, any new knowledge requires us to reflect on how to use it responsibly, without affecting others or ourselves.

Finally, it is hoped that the development of this proposal will enable us to provide input so that teachers who are not trained as natural science graduates can comfortably develop experimental practice in their work as science teachers, understanding that they face this challenge daily and, due to time constraints, find it very difficult to train themselves in these areas. Considering the interdisciplinary approach we have learned in the master's program, we have the possibility of articulating different fields of knowledge in favor of a bilingual learning environment that responds to the needs of the context in which we carry out our teaching work.

VIGILADA MINEDUCACIÓN - SNIES 1704

CONCLUSIONS.

The results show that integrating content with another language, in this case English, can help achieve better understanding and view the second language as a tool rather than a barrier.

The literature indicates that CLIL is crucial for promoting bilingual abilities, understanding of content, and intercultural skills, but its success depends significantly on the training provided to teachers, tailored materials, and fair evaluation methods (Banegas, Poole, & Corrales, 2020; Brown & Garcia, 2023). Although CLIL supports valuable learning experiences and a sense of global citizenship (Coyle, 2019; Marsh, 2024), it also poses difficulties like cognitive strain and language obstacles that can hinder student achievement (Nguyen & Tran, 2022; Kim & Park, 2021).

Bilingual classrooms show recurring challenges such as limited teacher training, lack of resources, and language barriers, with the particularity of conditions that students can have in the classroom, like the students in the research.

The material needed in these bilingual classrooms, where English is not the focus, need to integrate language and content with materials helpful for teachers and students and that can be adapted to every classroom.

Results show that CLIL, implemented in the right way, can promote science competences, language skills, and motivation, with learners valuing its integrative and participatory approach.

The method of action research was found effective for meeting the requirements of bilingual science classrooms, as it integrated assessment, tool creation, execution, and contemplation in a loop of ongoing enhancement. This method made sure that real-world difficulties were tackled,

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and advancements suggested, creating plans for skill enhancement in natural sciences, civic engagement, and English as a foreign language education.

The findings from various tools indicate that executing the Butterfly Cycle initiative via CLIL addresses the primary challenges and requirements recognized in bilingual science classrooms. Educators pointed out issues regarding students' self-assurance and restricted understanding of academic terminology, yet they also showed willingness to implement integrated methods. Parents displayed high hopes and interest in enhancing both science and English education, despite recognizing their inability to provide consistent help at home. Learners exhibited enthusiasm and interest in scientific topics, though their understanding of English was generally basic, necessitating tailored support. Overall, the data reinforce that CLIL, aided by the primer, enhances motivation, cross-disciplinary learning, and skill development while highlighting the need for ongoing refinement.

Educators and guardians view this method as a chance to enhance inspiration, engagement, and learning across various subjects, while learners demonstrate interest and eagerness even though they face certain language and conceptual difficulties. These results emphasize that the effectiveness of the initiative depends on how well teaching methods match the requirements of students, validating CLIL's ability to combine knowledge in natural sciences, civic education, and English skills in a relevant and context-based manner.

VIGILADA MINEDUCACIÓN - SNIES 1704

PROJECT EVIDENCE

Unit: We are butterflies

VIGILADA MINEDUCACIÓN - SNIES 1704

LISTA DE APÉNDICES.

- Apéndice A-CARPETA CEBIC:
  - Carta de conflicto de interés. 4. Carta Conflicto Interés.docx
  - Hojas de vida de los maestrantes.

    Valentina Hernández: 2. Hoja de vida CEBIC Valentina Hernández.pdf

    Laura Caro: Hoja_de_vida_CEBIC LAURA JULIANA CARO BALLESTAS.pdf

    Andrea Salamanca: 2. Formato_hoja_de_vida_Andrea Salamanca corrección .pdf
  - Formato CEBIC de presentación del proyecto. 1. Formato_de_presentación_de_proyectos_CEBIC_2025.docx

- Apéndice B-CARPETA DISEÑO METODOLÓGICO:
  - Diseño de los instrumentos.

    Instrumento 1:INSTRUMENTO 1.pdf

    Instrumento 2: INSTRUMENTO 2. ENTREVISTA.docx

    Instrumento 3: INSTRUMENTO 3.docx
  - Formato de aval de la(s) institución(es). 3. Orientaciones Carta Aval Institución(es).docx
  - Formato(s) de consentimiento/asentimiento informado diligenciado por los participantes. FORMATO CONSENTIMIENTO PADRES DE FAMILIA.odt
  - Formato(s) de consentimiento/asentimiento informado diligenciado por los participantes. FORMATO SUGERIDO VALIDACIÓN DE INSTRUMENTOS VANESSA ORDOÑEZ.docx

    FORMATO SUGERIDO VALIDACIÓN INSTRUMENTO(S) FERNANDO ESGUERRA.docx

Apéndice C-CARPETA DE RECOLECCÓN DE LA INFORMACIÓN

- Datos instrumento #1 RESULTADOS INSTRUMENTO 1.xlsx

VIGILADA MINEDUCACIÓN - SNIES 1704

- Datos instrumento #2 RESULTADOS INSTRUMENTO 2.xlsx
- Datos instrumento #3RESULTADOS INSTRUMENTO 3.xlsx

Matriz de análisis de resultados cualitativos y cuantitativos: Analysis results apendix.xlsx

Lista de tablas.

Tabla 1. Calendario de desarrollo del proyecto.....15
Tabla 2. Caracterización de la población.....17
Tabla 3. Resultados instrumento 3 48
Tabla 4. Componentes pedagógicos.....54

Lista de figuras.

Figura 1. Diagrama de torta pregunta 1, instrumento 1..... 32
Figura 2. Diagrama de torta pregunta 2, instrumento 1..... 32
Figura 3. Diagrama de torta pregunta 3, instrumento 1..... 33
Figura 4. Diagrama de torta pregunta 4, instrumento 1..... 33
Figura 5. Diagrama de torta pregunta 5, instrumento 1..... 34
Figura 6. Diagrama de torta pregunta 6, instrumento 1..... 34
Figura 7. Diagrama de torta pregunta 7, instrumento 1..... 34
Figura 8. Diagrama de torta pregunta 8, instrumento 1..... 35
Figura 9. Diagrama de torta pregunta 9, instrumento 1..... 35
Figura 10. Diagrama de torta pregunta 10, instrumento 1.....35
Figura 11. Diagrama de torta pregunta 11, instrumento 1.....36
Figura 12. Diagrama de torta pregunta 12, instrumento 1.....36
Figura 13. Diagrama de torta pregunta 13, instrumento 1.....36
Figura 14. Diagrama de torta pregunta 14, instrumento 1.....37
Figura 15. Diagrama de torta pregunta 15, instrumento 1.....37
Figura 16. Diagrama de torta pregunta 16, instrumento 1.....37

VIGILADA MINEDUCACIÓN - SNIES 1704

Figura 17. Diagrama de torta pregunta 17, instrumento 1.....38
Figura 18. Diagrama de torta pregunta 18, instrumento 1.....38
Figura 19. Diagrama de torta pregunta 19, instrumento 1.....39

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