Universidad de Valladolid

FACULTAD DE EDUCACIÓN DE PALENCIA
UNIVERSIDAD DE VALLADOLID

CLIL AND ACTIVE PEDAGOGIES FOR LEARNING SCIENCES IN ENGLISH FOR 4TH GRADE OF PRIMARY EDUCATION

GRADO EN EDUCACIÓN PRIMARIA
MENCIÓN EN LENGUA EXTRANJERA- INGLÉS
TRABAJO FIN DE GRADO

AUTORA: Paula Gázquez Diez

TUTORA: Margarita Robles Gómez

UVa PALENCIA

RESUMEN

Este trabajo se centra en la aplicación de metodologías activas y el Aprendizaje Integrado de Contenidos y Lenguas Extranjeras (AICLE) en una unidad didáctica de Ciencias para alumnos de 4º de Educación Primaria. Este proyecto propone integrar pedagogías activas en entornos de aprendizaje bilingües. El objetivo principal de este proyecto es integrar pedagogías activas y el AICLE, para mejorar el aprendizaje de ciencias en inglés, fomentando la participación y la resolución de problemas. La metodología se basa en un enfoque práctico y experimental, con actividades diseñadas para que los alumnos exploren los contenidos como; los tipos de energía fuerzas de contacto o sin contacto, etc. La evaluación se alinea con las competencias clave establecidas en la LOMLOE para los contenidos de ciencias y con el Marco Común Europeo de Referencia para las Lenguas (MCER), asegurando una evaluación integral del contenido y del desarrollo lingüístico. Las conclusiones de este proyecto sugieren que la combinación del AICLE y las pedagogías activas puede ser muy efectiva para facilitar la adquisición de conocimientos científicos y el desarrollo de habilidades lingüísticas en inglés. Esta propuesta busca que los estudiantes sean capaces de aplicar conceptos teóricos en contextos reales, demostrando así un aprendizaje significativo e integral.

PALABRAS CLAVE: AICLE, Educación Primaria, Pedagogías Activas, LOMLOE, MCER, Inglés como idioma extranjero, Inglés como lengua vehicular, Metodologías en Inglés y Ciencias.

ABSTRACT

This work focuses on the application of active methodologies and Content and Language Integrated Learning (CLIL) in a didactic unit of Science for students of 4th grade of Primary Education. This project proposes to integrate active pedagogies in bilingual learning environments. The main objective of this project is to integrate active pedagogies and CLIL to improve science learning in English, encouraging participation and problem solving. The methodology is based on a practical and experiential approach, with activities designed for students to explore content such as; types of energy, contact and non-contact forces, etc. The assessment is aligned with the key competences established in the LOMLOE for science content and with the Common European Framework of Reference for Languages (CEFR), ensuring a comprehensive assessment of content and linguistic development. The conclusions of this project suggest that the combination of CLIL and active pedagogies can be very effective in facilitating the acquisition of scientific knowledge and the development of language skills in English. Students are not expected to understand theoretical concepts, but also, be able to apply them in real life context, demonstrating meaningful and holistic learning.

KEY WORDS: CLIL**,** Primary Education**,** Active Pedagogies**,** LOMLOE**,** CEFR, English as a foreign language, English as a vehicular language, English Methodologies and Science.

INDEX

INTRODUCTION

This Final Degree Project of Primary Education of English Language specialty reflects the use of Active Pedagogies and Content Language Integrated Learning (CLIL) in a proposal of a Science unit for 4th grade of Primary Education.

Throughout this project, active pedagogies will be introduced within bilingual learning environments, specifically through the use of the CLIL approach. This document examines how these pedagogies share a student-centered vision that promotes active participation, intrinsic motivation, and the integrated development of linguistic and cognitive competencies.

Furthermore, CLIL is an educational approach where subjects are taught using other languages as the vehicular language. CLIL is a methodology that supports achieving the levels established by the Common European Framework of Reference for Languages (CEFR), which functions as an overview framework that defines proficiency levels and advocates for a communicative approach to language learning.

The CEFR is a guide used for describing the achievements of foreign language across Europe and beyond. Its main purpose is to establish a common basis for the development of language curricula, curriculum guidelines, examinations, and textbooks across Europe. To this end, the CEFR defines six broad levels of language proficiency: Basic User (A1 and A2), Independent User (B1 and B2), and Proficient User (C1 and C2).

Regarding bilingual learning, this paper will center on a bilingual section of a school and not a Bilingual School. The theoretical framework will detail the differences between the two linguistic approaches and the situation of bilingual learning in Castile and Leon.

In addition, this document proposes a specific didactic proposal focused on a Science unit, where English is used as the vehicular language. The theoretical framework will detail the choice of CLIL and active methodologies, justifying their relevance in promoting meaningful and contextualized learning. The objectives of this proposal are not only focused on the acquisition of scientific knowledge, but also on the development of linguistic competence in English and language skills such as writing, listening, speaking, reading, mediation, and interaction. Also, the improvement of Science key skills such as critical thinking, problem solving, and collaborative work.

Likewise, the proposal designed presents ranges from the contextualization of the unit and the specification of competences to the temporal organization, the methodology used, necessary curricular adaptations, and the evaluation criteria.

Ultimately, this dissertation seeks to demonstrate how the combination of CLIL and active methodologies can transform the primary classroom into an active and dynamic bilingual

JUSTIFICATION

This Final Degree Project is justified by the growing need to adapt education to the challenges and demands of today´s society, which requires citizens with solid linguistic competences and skills for meaningful and contextualized learning. In this sense, the proposal focuses on the application of two complementary approaches: Content and Language Integrated Learning (CLIL) and active methodologies.

The main reason for integrating active pedagogies with CLIL is the way in which both complement each other, resulting in active and meaningful learning. CLIL principles address the need for students to acquire a new language and also to use it as a functional tool for deeper learning moving beyond memorization.

Furthermore, the CEFR serves as an indispensable guide for language proficiency and communicative competence (Council of Europe, 2001). By aligning CLIL with the CEFR, the language acquisition in content subject is structured, measurable and aligned with European policy objectives. The CEFR provides a common framework for language programs and curriculum guidelines.

Moreover, the proposal in this paper search to break the separation between language and content by applying an integrated model where language becomes the vehicle for learning and content provides a relevant context for language development.

In addition, the incorporation of active methodologies as Gibbs (1981) defended is crucial to foster student-centered learning, where the student becomes the protagonist of his or her own educational process. These methodologies, which include cooperative work, experimentation and problem solving, promote active participation, critical thinking, creativity and the development of social skills. In the context of CLIL, active methodologies are particularly beneficial, as they provide constant opportunities for students to interact in English, negotiate meanings and apply the language in real and relevant situations, which facilitates the acquisition and consolidation of both content and language. (Marsh, D., 2013).

Furthermore, the proposal is based in the Organic Law 3/2020, of December 29, amending Organic Law 2/2006, of May 3, 2006, on Education (LOMLOE) Primary Education curriculum principles as well as it incorporates elements form the Norden Ireland curriculum for content sequencing. Also, this proposal offers an integrated framework that addresses academic, social and emotional development.

Finally, this project is justified by its contribution to teaching practice, offering a didactic unit that can inspire other teachers to apply CLIL in their classrooms. By proposing a Science unit for 4th grade of Primary Education.

RELATIONS WITH THE COMPETENCES OF THE DEGREE

These competences have been translated from Memoria de Plan de Estudios del Título de Grado Maestro - o Maestra en Educación Primaria por la Universidad de Valladolid by the author of this paper from Universidad de Valladolid. (2010). *Memoria de Plan de Estudios del Título de Grado Maestro -o Maestra- en Educación Primaria.*

GENERAL COMPETENCES

- To be able to apply different types of teaching-learning techniques.
- To be able to recognise, evaluate, plan and carry out good teaching-learning practises.
- To be able to critically analyse and argue decisions that justify decision making in educational contexts.
- To develop communication skills through the internet.
- To develop intrapersonal skills associated with the ability to interact with other people and work in groups.
- To acquire strategies and techniques of self-learning.
- To promote initiative, innovation and creativity in the exercise of the profession.
- To be aware of the intercultural reality and develop attitudes of respect, tolerance and solidarity towards different social and cultural groups.
- To know strategies that guarantee the right to equal opportunities.

SPECIFIC COMPETENCES

Final Degree Project

- To acquire practical knowledge of the classroom and its management
- To be able to apply interaction and communication process, as well as to master social skills and abilities necessary to foster a climate that facilitates learning
- To control and monitor the teaching-learning process by mastering some techniques and strategies.
- To be able to relate theory and practise within the reality of the classroom and the school.
- To participate in the teaching activity and learn how to do, acting and reflecting from practise, innovating and improving the teaching work.
- To be able to Participate in the proposals for improvement in the different areas of action that a center can offer.
- To be able to regulate the processes of interaction and communication in groups of students aged 6-12 years.
- To be able to collaborate with the different sectors of the educational community and the social environment.
- To acquire habits and skills for autonomous and cooperative learning and promote it in students.

English Language

- To acquire linguistic and socio-cultural knowledge of the foreign language.
- To know the cognitive, linguistic and communicative basis in the acquisition of languages.
- To use oral expression and dramatization techniques as communicative resources.
- To know the main didactic currents of the foreign language teaching and their application in the classroom.
- To know the Primary Education curriculum and the curricular development of foreign languages
- To be able to develop positive attitudes toward linguistic and cultural diversity in the classroom.
- To promote the development of oral and written productions.
- To plan the teaching-learning process of a foreign language selecting and elaborating teaching strategies.

OBJECTIVES

MAIN OBJECTIVE

- The main objective of this project is to design an intervention proposal based on Active Methodologies and Content and Language Integrated Learning (CLIL) in a unit proposal of Science for 4th grade students.

SPECIFIC OBJECTIVES

- To integrate active pedagogies within bilingual learning environments.
- To demonstrate the benefits of the implementation of Active Pedagogies in a Science unit.
- To ground the design of learning experiences based on experiential tasks.
- To establish the scientific method as a research tool to observe, think and solve problems systematically.
- To promote the understanding of scientific concepts by connecting them to real-world contexts.
- To create a Content and Language Integrated Learning (CLIL) environment that connects, Science and Language, using English as a vehicular tool for developing scientific knowledge.
- To lay the foundational cognitive, linguistic, and communicative elements essential for language and content learning within a CLIL framework.
- To have a specialized bibliographic review on the different topics covered by the paper.

THEORICAL FRAMEWORK

The purpose of this theoretical framework is to contextualize and support a proposal in which active pedagogies will be applied in bilingual learning environments through the CLIL approach (Content and Language Integrated Learning). Both methodological currents share a student-centered vision, promoting active participation, intrinsic motivation and the development of both linguistic and cognitive competencies. In the first chapter of the "CLIL: Content and Language Integrated Learning" (Coyle, Hood and Marsh, 2010) stated that CLIL is a dual educational approach in which an additional language is used for learning and teaching content and language with the aim of promoting mastery of both content and language to predefined levels. This perspective is clearly content centered by drawing on the subject matter as a vehicle for language acquisition. CLIL extends the language learning experience integrating the language into meaningful contexts.

The foundations of CLIL are based on several pedagogical and linguistic principles, which are set in a framework proposed by Coyle (2010) it has four elements that should have every CLIL lesson and called it the 4 Cs: content, communication, cognition and culture. The content stands for the subject matter itself, focusing on acquiring knowledge, skills and understanding a topic. The next one, communication refers to the language that learners use to interact, express ideas and understand the content. In addition, cognition refers to the thinking skills involved in the processing of the content. Finally, culture is the intercultural understanding of our self and others.

Coyle (2010) says that the CLIL is centred in the use of a language to learn some content while practising that language. Since the CLIL connects language and content we must rely on The Common European Framework of Reference for Languages (CEFR).

CEFR is the compound of skills that teachers have to develop in their students in order to teach languages following a communicative purpose. This framework also includes the cultural context where the language is set. In addition, it has different levels of proficiency that allow students to measure their progress.

Moreover, the CLIL approach helps in the development of bilingualism, as it uses the foreign language as a tool for learning content. According to, Hammers and Blanc (2000), Bilingualism is the ability of an individual to master two languages and use them in different types of interactions at the same level. Bilingualism is applied in schools from two different approaches: Bilingual Sections and Bilingual Schools. The bilingual sections are the most common ones, in which only some of the subjects are taught in a foreign language without exceeding the 50% of the student's schedule. Also, the schools that have bilingual sections have to present a bilingual educational plan that follows the Spanish curriculum (ORDEN/EDU/6/2006). On the other hand, bilingual schools have an integrated curriculum of both languages taught in the school. In this model, the students are taught in both languages in all or most academic subjects, defined by the ORDER of April 5, 2000 (BOE May 2).

Furthermore, by thoughtfully integrating CLIL with active methodologies, we can create dynamic and effective learning environments that move away from the artificial separation of language and content. Instead, language becomes the tool for learning and exploring the content, and content provides a rich and relevant context for language development, ultimately fostering both language proficiency and a more profound mastery of the subject matter.

CONTENT AND LANGUAGE INTEGRATED LEARNING IN PRIMARY EDUCATION

One of the methodologies used to teach foreign languages is CLIL. Brevik and Moe (2012) have researched about CLIL outcomes, as any other methodology CLIL has advantages and disadvantages. On one hand, CLIL improves student´s language skills by immersing them in the foreign language using it as the primary vehicle for exploring other subjects. This approach makes language acquisition more natural and contextualized. This exposure improves the acquisition and development of the four skills: listening, speaking, reading and writing. It also builds fluency and confidence by fostering a deeper understanding of content.

Furthermore, CLIL gives a context to the language use, this makes the language relevant and purposeful, and the students are more engaged with the learning process. This engagement prepares the students by putting them through real-world contexts, alongside with crucial cognitive skills like critical thinking and problem-solving, which are essential competences they will need in a near future allowing students to communicate and collaborate, with other people. CLIL also promotes intercultural awareness by exposing students to diverse perspectives and authentic materials; students gain a deeper understanding of different cultures. This cultivates empathy, tolerance, and the ability to interact respectfully and effectively in varied cultural settings, ultimately shaping globally competent and culturally sensitive individuals.

Moreover, the CLIL approach is applied in bilingual programs such as bilingual sections or bilingual schools. On one hand, the bilingual sections elaborate a bilingual educational plan that follows the Spanish curriculum (ORDEN /EDU/6/2006). In this plan they can choose which non-linguistic subjects (at least two and no mere than three) are going to be taught in a foreign language (English, French, German, Italian or Portuguese) but without exceeding the 50% of the student's schedule. On the other hand, in bilingual schools, the students are taught in both languages in all or most academic subjects. Also, some bilingual schools follow the Ministry of Education–British Council model (MEC-BC), in which involves the incorporation of language assistants selected by the Ministry of Education and the British Council:

> The MEC-BRITISH schools apply the Hispano-British curriculum approved by the ORDER of April 5, 2000 (BOE May 2), which incorporates aspects of the British Curriculum (National Curriculum) into the curriculum of common teachings and

compiles with the regulations stablished in Royal Decree 717/2005, of June 20, which regulates the organisation of the teachings in the educational centers under the agreement (Da Cruz et al. 2015)

This is an example of integrated curriculum, in which the Spanish Curriculum and the British Curriculum are combined to develop both of them

.

Following with bilinguism, in 1996 in Castile and Leon started a program called: MEPF-British Council-CyL agreement. It was created for the realisation of integrated curricular projects and educative activities. The main objective of this program is to develop a Spanish-English bilingual program from an early stage, with special emphasis on English language literacy, through the delivery of an integrated curriculum that considers both the Spanish and British curricula. It is carried out in public schools, starting from the second cycle of infant education until the end of compulsory secondary education.

However, CLIL faces practical challenges like, the need for highly competent teacher who are proficient in the subject he/she teaches, but he/she must also possess a high level of competence in the foreign language of instruction. There is also a delicate balance between content and language, focusing too much on one can dilute the other. As Tang (2019) stated, the balance between content and language is an accentuated challenge when the starting level of the learner in the foreign language is very low, which requires considerable scaffolding.

In turn, Science has its own difficulties to be imparted in English. One of the main barriers is linguistic, which affects both students and teachers, especially in the initial stages, may have a low level of English and have difficulties understanding complex scientific concepts. This situation can lead to anxiety caused by the loss of self-esteem (Horwitz, 2000). This barrier is inherent to science terminological and conceptual complexity. The need for precision in scientific language often clashes with the difficulty of expressing oneself accurately in a non-native language, which can lead to conceptual misunderstandings.

As we are leading with Science, the proposal includes STEAM (Science, Technology, Engineering, Arts and Mathematics). Therefore, Morza et al (2023) organised the components for the STEAM competence are mathematical competence, competence in natural science, information and digital competence, civic and social competence, cultural competence, environmental literacy, entrepreneurship and knowledge of a foreign language.

We can define these skills as: “They are a combination of the ability to produce scientific knowledge, supported by mathematical skills, in order to design and build (engineer) technological and scientific products or services.” (Siekmann and Korbel, 2016, p. 46).

Finally, teaching and assessment adds another layer of difficulty. Teaching Science in English requires a shift towards more active and participatory approaches that encourage interaction, which is not always easy to implement. The heterogeneity of English levels in the classroom also complicates individualized attention.

Likewise, assessment is more complex, as mastery of scientific content and linguistic progress must be measured simultaneously and fairly, without confusing language limitations with lack of conceptual understanding. For example, if we are using CLIL, assessment must address the goals and the objectives of two different subjects. This means evaluating, knowledge, competences, skills, attitudes, and behaviour, for both language and content as compared to one subject such as Science (Massler, 2011). Some tools for language assessment can be setting specific communication tasks (like oral presentations), observing spontaneous language used in the classroom (conversations with peers) or collecting work samples (written assignments, projects, etc.). In addition, for content assessment we can use tests, essays, projects, quizzes, etc.

RELATIONSHIPS BETWEEN CLIL AND CEFR

Content and Language Integrated Learning (CLIL) is a dual educational approach that combines subject content with additional language acquisition (Coyle et al. 2010). Meanwhile, the Common European Framework of Reference for Languages (CEFR) is a framework that sets common standards for language programs, curricula, examinations, and textbooks across Europe (Council of Europe, 2001). The CEFR defines proficiency levels and seeks a communicative approach to language use.

Both CLIL and the CEFR main goal is to achieve multilingualism and to improve the quality of language teaching. CLIL's pedagogical principles are characterized by being competency-based and learner-centered, aligning with the CEFR's model of communicative competence. This makes the CEFR essential, due to its descriptive and assessment function for articulating, measuring, and validating learning outcomes in CLIL programs.

Moreover, CLIL and CEFR focus on holistic learning and action-oriented learning. On one hand, CLIL aims to offer an integral educational experience by connecting content knowledge with language acquisition, making learners active participants in developing their potential. In this model, the teacher changes from being the one that gives the knowledge to a facilitator (Marsh, 2013). On the other hand, the CEFR, provides the ideal theoretical foundation for CLIL's practical goals, viewing language users and learners as "social agents" who complete various tasks by strategically applying their specific competencies.

However, this clear connection demonstrates how CLIL effectively puts the CEFR's language learning philosophy into practice. CLIL's content-driven nature means language is used as a tool to achieve learning. This directly aligns with the CEFR's perspective of language as a dynamic tool for real-world tasks. By integrating language use into meaningful, content-based activities, CLIL enables learners to genuinely engage with both the subject matter and the language, effectively bridging the gap between theoretical linguistic knowledge and practical communicative performance (Soltani, 2023).

In addition, the CEFR defines plurilingualism as an individual's communicative competence where all language knowledge and experience interrelate. It acknowledges that this competence is often "uneven" and evolves over time, validating even "partial competence" as a meaningful part of an individual's broader linguistic repertoire. This aligns perfectly with CLIL's flexible implementation. CLIL, by its very nature, acts as a practical vehicle for achieving the sophisticated plurilingual and pluricultural outcomes that the CEFR describes theoretically.

In conclusion, the CEFR's comprehensive assessment framework, including descriptors of communicative activities and aspects of proficiency, provides concrete tools for evaluating CLIL outcomes. Tools like the ALTE 'Can Do' statements, which are explicitly linked to CEFR levels, are highly practical for defining and assessing specific, content-related language abilities within CLIL programs (North, 2007). Additionally, the CEFR outlines various assessment types, all of which are adaptable for CLIL contexts.

ACTIVE METHODOLOGIES

Active Methodologies promotes the student to be the key figure of their learning experience, fostering their active role in building knowledge instead of passively receiving it. "Teaching is a two-way process of knowledge transmission. The teacher learns from the student and the student learns from the teacher. The student teaches his teacher to teach him." (Cálciz, A. B.,2 011, p.7).

Moreover, active methodologies are the essential vehicle for students not only to acquire knowledge, but also to develop the ability to apply it effectively in real situations, that is, to acquire competencies such as: critical thinking, autonomy, etc. Some of those competences, are in the current educational context, and these competences imply the ability to mobilize knowledge, skills, attitudes and values to solve problems and perform effectively in various scenarios, both academic and every day.

In addition, there are eight key competencies, such as critical thinking, communication, problem solving or the ability to learn to learn are acquired actively by doing, it can be experimenting, discovering or creating (Vilaplana et al., 2010).

Furthermore, this is where active methodologies come in, as Piaget (1972) defended, placing the student at the centre and as the protagonist of his or her own process. The teacher, in this model, becomes a facilitator, guiding the student through authentic learning experiences where knowledge is constructed through action, research, experimentation and reflection.

Another possibility of application of the active methodologies is when we challenge students to investigate, plan and solve problems, their critical thinking and autonomy are directly stimulated (Walker, 2003). The teamwork inherent in many of these methodologies

fosters collaboration and effective communication. In addition, by making learning more relevant and connected to the real world, motivation and engagement are increased, essential factors for competencies not only to be acquired, but also to take hold and become more effective.

Finally, some of the active methodologies that are going to be used are: Meaningful Learning, Constructivism, Scaffolding, Discovery Learning, Inquiry-Based Learning, Experiential Learning, Task-Based Learning, Project-Based Learning and Competence-Based Learning.

RELATIONSHIPS BETWEEN CLIL AND ACTIVE METHODOLOGIES

By integrating CLIL with active methodologies, we can create dynamic and effective learning environments where students are actively engaged in constructing their own knowledge and developing language skills simultaneously. This approach moves beyond traditional passive learning, fostering deeper understanding, increased motivation, and a greater ability to apply both the language and the content in meaningful contexts**.**

According to Piaget (1972), knowledge is not transmitted passively but is actively constructed by the student himself through interaction with his environment and peers, that is called Constructivism. In Constructivism, the student is the protagonist of his or her learning, and the teacher acts as a guide. CLIL inherently adopts this philosophy: it is not about the science teacher giving the students information in English, but about the students using the language as a tool to investigate, debate, solve problems and create in the context of the subject.

Following Constructivism, we cannot forget Vygotsky's theories about the zones of proximal development (ZPD). These refer to the distance between what a learner can do autonomously (his actual level of development) and what he can achieve with the help and guidance of a more competent individual (his potential level of development).

This brings us to scaffolding, in which is the instructional strategy or set of actions that a more knowledgeable other (a teacher, parent, or more capable peer) uses to help a learner navigate and master tasks within their ZDP. Scaffolding is a dynamic process where the support provides is adjusted to the learner´s progress. The main goal of scaffolding is to make the learner able to perform a task independently (Nordlof, 2014).

We can see a connection between CLIL and ZDP as learners are constantly exposed to new concepts and to vocabulary and linguistic structures they have not yet mastered. This scenario inherently creates a ZDP. Learners cannot comprehend content or express their ideas fully autonomously in the foreign language (their actual developmental level). However, with the right support, they can come to understand and communicate the content (their potential developmental level).

Also, since students in CLIL are operating in their ZDP, the teacher not only teaches the content, but also supports language learning to make access to that content possible.

Another methodology from the Constructivism is Meaningful Learning. Ausubel et al. (1968) established Meaningful Learning principles. They said that we construct meaning when we can establish relationships between new knowledge or prior knowledge. Meaning is constructed from the assimilation of new information, and this is linked to the information we already have. It is related with the A content is meaningful the more it is related to what we already know. Meaningful Learning is given when students connect new information with their previous knowledge and experiences. It is important to encourage students to share their thoughts, to use real-life contexts and to choose relevant and engaging topics.

Furthermore, the Discovery Learning of Bruner (1960) argues that the teacher is a mere mediator or guide in the learning process. The teacher gives them the necessary tools so that the students are the ones who discover what they want to learn, this is inherently connected with scaffolding where the teacher is the mediator for the learning. Habits of research and rigor are encouraged while meaningful learning takes place. Discovery learning encourages students to explore and find answers by themselves. They use the language to ask questions, explore materials, share findings and make connections. The hands-on experiments are discovery activities because students are actively involved in exploring concepts and using language to describe what they observe.

Moreover, continuing with another hands-on approach we have Inquiry-Based Learning (IBL) which helps students connect what they already know with scientific explanations of the natural world (Nuangchalerm and Thammasena, 2009). It should also give them chances to value and grasp different ways scientific investigations are conducted.

When IBL methodology is integrated with CLIL, the foreign language ceases to be an end and becomes the essential and authentic tool of that inquiry. Students not only learn English, but they also use it to read sources, debate with peers, structure their arguments and present their conclusions on a scientific or historical topic.

Continuing with the Inquiry-Based Learning, there is the main method of investigation, the Scientific Method. The Scientific Method as Westwood (2006) says is the development of scientific process skills that enables students to address scientific problems through actions such as asking questions, discussing ideas, making observations and predictions, and conducting data-driven experiments and analyses.

Another methodology is Experiential Learning which encourages students to learning by doing. The language is not just studied, instead it is experienced by building models, conducting experiments and presenting findings. The students are actively involved, making the language learning meaningful and memorable.

Besides meaningful learning, the active methodologies defend the student's autonomy. According to that, Oxford (2006) says that the Task Based Learning consist in giving our students some duty or piece of work they must complete to achieve a certain outcome. That outcome is set to accomplish certain goals. TBL tasks require students to plan how they will approach the problem, research the necessary information, execute the task, and sometimes present their results, making them more autonomous.

Subsequently, the Task-Based Learning provides a reason for language use in CLIL. Such as in Science; instead of learning vocabulary about forces students use language to perform tasks with forces (e.g., “measure the force needed to lift this”, “describe how this machine changes the direction of the force”).

As well, Project-Based Learning (PjBL) as Harris (2002), McGrath (2002) and Solomon (2003) states that this methodology engages students in the learning process. This approach trains their problem-solving skills as they collaborate, reflect on their learning, and become active in the search and decision-making processes, improving their practical thinking.

In addition, the Project-Based Learning creates opportunities for language development in a meaningful context. When the students communicate, explain and present a project, CLIL provides the content and the language (e.g., when students design a machine, they use English to explain the machine´s function).

On top of that is Competence-based learning, which is an educational approach that moves away from the mere accumulation of theoretical knowledge to focus on what the student can do and know how to do in real and complex situations. (Ildefonso, J. et al, 2008, pp. 101-103) This approach is based on the definition of a clear academic and professional profile, establishing the general and specific competencies that students must acquire and demonstrate throughout their training process.

To sum up, although a brief list of active methodologies have been briefly presented here all of them complement the CLIL approach. On one hand, active approaches enable students to construct their knowledge and develop both personal and curricular competencies. Likewise, CLIL provides a real context for language use. When they come together, a comprehensive approach is achieved which cultivates not just what students know, but what they can do with their knowledge and linguistic abilities.

DESIGN OF THE DIDACTIC PROPOSAL

1.-INTRODUCTION AND JUSTIFICATION

This learning situation “The forces around us” is designed to be carried out with nine- and ten-years old students in fourth year of Primary Education.

This unit is designed to follow the principles of the LOMLOE´S Primary Education curriculum and the Northern Ireland curriculum by emphasizing competency-based learning and a multidisciplinary approach. The aim is that students try meaningful experiences that foster their academic, social, and emotional development.

In addition, this unit integrates Natural Sciences and English through Content and Language Integrated Learning (CLIL). This approach develops both subject knowledge and language skills. Furthermore, this learning situation emphasizes Experiential learning through hands-on activities and practical experiments that promote active exploration of real-world phenomena and knowledge construction.

Through the application of the Scientific Method, students will develop skills in formulating hypothesis, conducting experiments and analysing results, as well as it reinforces their ability to present findings in English. This inquiry-based approach fosters critical thinking.

Furthermore, Project-Based Learning (PjBL) is central to this unit, especially in the final task where students solve a real-life problem using their knowledge. Moreover, Task-Based Learning (TBL) is woven into each lesson. Finally, to support their progress, scaffolding is strategically used, gradually increasing the complexity of tasks and concepts.

2.- CONTEXT

2.1- THE SCHOOL

This proposal is going to be carried out in a public school. This school is located near the center of a small town. The school has two classrooms per grade. It is also a centre with a bilingual section in the areas of Physical Education, Art Education and Natural Sciences.

The school is close to the community surroundings including visits to parks and gardens, museums, theatres and libraries, other schools and services such as the local police, fire brigade, residential homes, etc.

About the students that attend this school, there are pupils who come from different areas: the majority live close to the centre, a certain group of children use school transport to come from a near village, a small group come from a residential area close to the centre and,

finally, some pupils do not live in the area, but come because their parents work close to the centre. The areas close to the centre are commercial and service oriented. The neighbourhood is characterised by middle class people with a predominance of civil servants, shopkeepers and workers with a high birth rate.

Finally, some of the consequences of the socio-cultural level of the area are the following: many pupils come from nursery schools when they start school, or they start in the First Cycle of Infant Education services that the school has, so they have habits of autonomy that favour the teaching-learning process; in some classrooms there are many pupils with needs, so there is a large number of ordinary reinforcements in which the guidance team is very committed to the families; and finally, most pupils attend complementary and/or extracurricular activities.

2.2.- THE CLASSROOM

This proposal is designed to be applied with 4th grade students of Primary Education. The class has 25 students. The students have a good level of English. The students are participative, and they enjoy learning new things.

The organisation is not trivial, as there are students that need to be in the front row, because they need more concentration and are easily distracted. Also, disruptive students are separated, each one is in one corner of the classroom. They are seated by pairs or threes, because there is not much space. The classroom is small, and it could be larger for greater and better mobility. In addition to the tables, there is a table at the bottom of the class where the students leave books and notebooks from some subjects.

The activities proposed are adapted so every student can participate and develop their skills. There is one student with special needs in hearing, so all the activities are accompanied by visual aids.

The unit follows the Spanish educational curriculum to ensure that the contents and competences are developed. The sequence of science contents is based on the Northern Ireland educational curriculum to establish the relationship between them and another cross-curricular contents.

3.- UNIT OBJECTIVES

These objectives are aligned with the Spanish curriculum LOMLOE Organic Law 3/2020, of December 29, which amends Organic Law 2/2006, of May 3, 2006, on Education and Council for the Curriculum, Examinations and Assessment (CCEA) for content organization.

Main objectives

- To use English as a vehicular tool for learning the forces, through the scientific method.
- To develop critical thinking by making hypotheses.
- To express themselves in a non-native language, producing oral presentations, to present the results of an investigation.

Specific objectives

- To identify the forces that are around us (contact and non-contact forces)
- To identify simple machines
- To relate that simple machines and the forces they use
- To design and test models of simple machines to solve problems
- To experiment to test hypotheses

4.- COMPETENCES

4.1.- KEY COMPETENCES

- Competence in linguistic communication (CCL): Students will present their findings, explain machine functions, and engage in debates and discussions. Thy will also use multimodal texts in activities like creating posters and oral presentations.
- Multilingual competence (CP): Students will use English as a vehicular language for learning sciences and learn how to think in a non-native language.
- Science, Technology, Engineering and Mathematical Competence (STEAM): The unit is centered on learning Natural Sciences content, specifically about forces and simple machines. It also integrates the Scientific Method, where students formulate hypotheses, conduct experiments, analyse data, and draw conclusions. The final product involves students in solving real-life problems by designing machines.
- Digital competence (CD): Digital tools will be used to search for information in a safe and controlled way.
- Personal, social and learn to learn competence (CPSAA): Students will develop critical thinking trough observation, experimentation and analysing the results. The use of self-assessment will also make students more aware of their learning.
- Civic competence (CC): Collaborative work and cooperative learning are explicitly encouraged and are key methodological aspects. Students are expected to collaborate with their classmates and build final products as a team. They must think about needs they have and invent some new machine, demonstrating creative solutions and active involvement.
- Entrepreneurship competence (CE): Students produce creative solutions and are actively involved in carrying out activities.
- Cultural Awareness and Expression competence (CCEC): scientific concepts are related will their near context and with the past (trough some history facts). In lesson 7

specifically involves investigating "greatest inventions and their impact in our daily lives," which connects scientific concepts with history and societal impact.

The specific competences are in the appendices (APPENDIX I)

5.- TIME ORGANIZATION

Table 1

Unit timeline of the lessons

LESSONS	WEEK 1	WEEK 2	WEEK 3	WEEK 4
Lesson 1				
Lesson 2				
Lesson 3				
Lesson 4				
Lesson 5				
Lesson 6				
Lesson 7				
Lesson 8				

This unit is planned to be implemented in the third term of the school year. The unit is designed for 8 lessons of 60 minutes. The students of 4th grade have 2 hours a week of Natural Sciences. They have two lessons per week of 60 minutes each.

6.- ABOUT THE UNIT

This educational unit will be developed in a public school in a small town. It is set for 4th grade in a class of 25 students. It fits into the Natural Sciences curriculum and will work on content related to understanding forces and their applications. It will develop curiosity and problem-solving skills.

Methodologically, the unit incorporates CLIL, by using English as the primary language for delivering Science content. The teaching approach is highly active, with task resolution forming the core dynamic of the sessions. Cooperative learning is a key component, promoting student autonomy and encouraging teamwork.

To ensure effective learning, the unit considers the students' prior knowledge, which includes the ability to work in pairs and groups, practice respect towards others, follow instructions carefully, and engage in respectful group discussions. They must have a basic understanding of forces (push, pull, and lift) and different types of energy.

The language used in the unit will be the present simple tense and imperative sentences to facilitate clear communication of instructions and concepts. A colour code will be employed to help students identify the grammatical nature of words. Additionally, verbs necessary for task instructions will be introduced through active dynamics and commands.

Important resources for the unit include a digital board, projector, science books, observation sheets, experiment sheets, booklets, cardboards, pencils, and markers.

7.- LESSONS OVERVIEW

This unit is structured into eight lessons (APENDIX II), each designed to build students' understanding of forces, simple machines, and energy, culminating in a design project. Each lesson has, a main activity, a learning goal and some assessment criteria.

In the first lesson, the forces and simple machines will be introduced with a debate where the students can exchange their previous knowledge about forces and machines and formulate questions about what they want to learn. The main learning goals of this lesson are to identify and to understand the concepts of forces and how forces operate. Finally, the assessment criteria for this lesson are that students should be able to formulate at least one question about the topic, discuss what they already know and identify forces and simple machines (APPENDIX III).

In the second lesson, we will see the forces in our daily life. The students will conduct some experiments with various objects to explore push, pull, gravity and friction concepts. The main learning goals are to identify forces in everyday objects and learn to follow the scientific method. Finally, the assessment criteria in this lesson are: to follow the scientific method (making hypotheses, taking notes of results, drawing conclusions) and identify forces in daily life objects (APPENDIX IV) and (APPENDIX V).

In the third lesson the students will learn about non-contact forces such as magnetism and gravity. Students will experiment with different objects to observe gravity (e.g., objects falling at the same speed) and magnetism. The main learning goals are to identify magnetism and gravity in daily life, to define non-contact forces, and to describe these phenomena. Finally, the assessment criteria for this lesson are students must be able to define non-contact forces and to describe both magnetism and gravity (APPENDIX VI).

In the fourth lesson, students will learn about the effects of forces. Students will identify and test the effects of forces on some objects, observing how forces can make objects move or stop, change their shape, or break them. The main learning goals are to identify forces and their effects, and to relate the properties of objects with how forces affect them. Finally, the assessment criteria for this lesson are to identify forces and their effects, register the results, and relate the properties of the objects with how forces affect them (APPENDIX VII).

In the fifth lesson, students will identify and build simple machines. Students will construct and test models of simple machines (pulley, lever, and inclined plane), experimenting with different variables and recording results. The main learning goals are to identify simple machines (pulley, lever, and inclined plane), to follow instructions, and to explain how simple machines work. Finally, the assessment criteria for this lesson are to identify simple machines

(pulley, lever, and inclined plane), to follow instructions, and to construct and test models of simple machines.

In the sixth lesson, students will learn about the four types of energy. Students will brainstorm ideas about energy and then investigate four types: mechanical, light, electric, and chemical energy. The main learning goals are to identify the four types of energy, to describe the four types of energy, to explain how energy works, and to identify the sources of each energy type. Finally, the assessment criteria for this lesson are to identify the four types of energy, to describe the four types of energy, to explain how energy works, and to identify the sources of each energy type (APPENDIX VIII).

In the seventh lesson, students will learn about the greatest inventions and their impact on our daily lives. Students will investigate important inventions and their societal relevance, followed by a presentation of their findings. The main learning goals are to learn about the greatest inventions and their impact on our daily lives, and to investigate and present their findings in an organized way. Finally, the assessment criteria for this lesson are to search for information, to present the topic, to work in groups, and to use vocabulary related to inventions.

In the eighth lesson, students will design a final product to solve a problem. Students will think about needs they have (or about a given situation) and invent some new machine, explaining its purpose and how it is used. The main learning goals are to design a final product to solve a problem, and to demonstrate what they have learned in the unit by applying the contents into a design project and presenting it. Finally, the assessment criteria for this lesson are to recall types of energy, to recall contact forces and non-contact forces, to give ideas to solve problems, and to present a final product.

8.- METHODOLOGY

This unit is designed to engage students in the exploration of forces and simple machines through a variety of active methodologies, that enhance understanding and skill development.

One example of active approach is experiential learning, it provides students with hands-on experiences through experiments where they directly interact with materials, observe phenomena and experience concepts like push, pull, gravity or magnetism firsthand. The construction and testing of simple machine models further reinforce this learning through direct engagement. These activities promote the construction of their own learning such as in constructivism theories presented by Piaget, Dewey and Vygotsky.

Another one is, the Scientific Method as Westwood (2006) defended is integrated into these experiential activities (which one are magnetic materials), particularly in lessons focused on exploration and discovery. It connects with Discovery learning as Bruner (1960) stated is also present, with inquiry-based questions such as (Nuangchalerm and Thammasena, 2009) expose, encouraging students to explore and find answers. Before starting a new lesson, the

previous one is reviewed and before starting new content questions about the new content new content, we ask ourselves questions such as; what are the forces, what are they for, how do they work, etc. This strategy is also part of the constructivism in which we can see the zones of proximal development (ZPD) of Vygotsky´s. These refer to the distance between what a learner can do autonomously (his actual level of development) and what he can achieve with the help and guidance of a more competent individual (his potential level of development).

Moreover, Project-based learning as Harris (2002), McGrath (2002) and Solomon (2003) fundamented in their works, is applied in this proposal, especially in the final lesson where they have to think about a real-life problem and with the knowledge they have acquired during the unit, they apply it in the design of a machine that help us or solve that initial problem. This one is like, Task-based learning as Oxford (2006) laid out in his work, in this unit TBL is woven throughout all the lessons, structuring each lesson around specific activities and objectives that require students to complete tasks such as conducting experiments, building models, researching and presenting findings.

Furthermore, parting from Ausubel et al. (1968) work on Meaningful Learning, this unit promotes the connection of the lessons with students' prior knowledge, facilitating the integration of new information with existing understanding. This connects with Piaget´s idea of Constructivism, which is reflected in the project-based learning activity, were students design their own machines, empowering them to be aware of their learning and construct solutions based on their knowledge.

The unit is also firmly grounded in competence-based learning. It identifies general and specific competences that students acquire throughout the lessons. There are two types of competencies they must acquire: personal competences (critical thinking intrapersonal, etc.) and the curricular key competencies (linguistic communication, plurilingual, etc.). They must check at the end of each lesson which competences such as the ones proposed by Ildefonso, J. et al. in 2008, and asses which ones they have succeed on.

Finally, scaffolding is strategically applied to support learning. This includes progressive increase in the complexity of tasks and concepts as Vygotsky's idea of scaffolding (Nordlof, 2014, p. 45). The lessons are well-structured with clear objectives, activities, and assessment criteria. The assessment criteria are differentiated to cater to different learning levels, providing scaffolding to ensure all students can achieve success. There is also some guidance of the teacher like, explaining concepts, facilitating discussions, providing feedback, and helping during activities.

9.- CURRICULAR ADAPTATIONS

There are some measures taking place for the student with hearing deficit. As stated, before all the activities will be accompanied by visual aids. This that can be helpful for all the students, such as subtitles in videos or another audio materials.

Also, this student will be allocated near the teacher to hear explanations and to be part of the lesson. Silence will be encouraged specially during explanations and presentations, to minimize the Ambiental noise in the classroom to facilitate the hearing.

Another measure will be to provide written material about the lesson summaries or outlines with key words.

Moreover, the teacher will only speak when the student look to them and the teacher will draw their attention when this does not happen.

Finally, the teacher will check for understanding regularly focusing on this student but also on all the students, all these without forgetting about being patient and giving extra time to those students who may need it.

1O.- ASSESSMENT AND EVALUATION

There will be two types of assessment: assessment for learning and assessment of learning.

The assessment for learning will include teacher´s observation, self-assessment and peer assessment. The teacher´s observation (APPENDIX IX) is recorded on observation sheets. There is an observation sheet per lesson which is filled by the teacher, providing a detailed record of student engagement and progress.

Moreover, the assessment of learning will be carried out with detailed rubrics following the three levels of attainment (“All children must be able to”, “Most children should”, “Some children could”) for oral presentations, a collection of significant student work (experiment sheets) and the final product (machine to solve a real problem). All the assessment criteria are evaluated as: achieved, needs improvement or not achieved. For oral presentations the teacher will use an evaluation rubric to evaluate the students (APPENDIX X).

The teacher will also check for understanding during the lesson, to ensure that all the students are following the lesson and they have no doubts. It will be done by asking questions to the students related to the topic of the lesson to check if they have understood.

The self-assessment and peer-assessment will be implemented through evaluation targets (APPENDIX XI). At the end of each lesson, they must complete an evaluation target for self-assessment and if they have been working as a team, also a peer-assessment one. This evaluation will make them more aware of their learning.

As part of the formative evaluation the teacher´s observation sheets have a section in which the teacher records observations on classroom management issues student conflicts, the timing and pacing of lessons, the physical organization of the learning environment, and any pedagogical or organizational adjustments made during the unit.

Finally, the summative evaluation of the unit will be: oral presentations 20%, self-assessment rubrics 10%, peer-assessment rubrics 10%, teacher observation sheets 20%, evaluable materials (experiment sheets, prototypes, etc.) 10% and the final product 30%.

11.- ANALYSIS OF THE PROPOSAL

The proposal that appears in this dissertation has been partially put into practice in a real classroom during the internship that the author of this paper has carried out. This proposal has been adapted after assessing what works and what does not work in the reality of a classroom.

In addition, the context where it is set is also a bit different, because in the internship of the proposal in this document a shorter version was put into practice due to time organization. Also, the classroom context is not the same. The proposal in this paper is adapted for a class with a student with a hearing deficit.

To analyze the proposal, the author of this paper has made a SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis of the unit.

One of the strengths or inner strong points is the fusion of CLIL and Active Pedagogies. This combination generates deep and meaningful learning, as students assimilate information, by actively constructing it and being motivated and eager to learn. We can see their engagement in these evidence sheets (APPENDIX XII)where we can see the evidence of the same group in two different lessons and (APPENDIX XIII) where we can see the difference between the two groups in the same lesson.

Another strength is the inclusive pedagogical approach by ensuring that all students can actively participate in all activities, assigning a role to each one. This creates a learning environment where no one is left behind, and equitable participation is encouraged.

This connects with another strength, which is the attention to the diversity of the students, with differentiation of achievement levels (“All children must,” “Most children should,” “Some children could”) all students can experience success in reaching goals at their level, motivating them and validating their efforts. This makes it easier for students who need more support. In addition, in the case of the new proposal, since we have a student with a hearing deficit, we make strategic use of illustrations, images and manipulative materials (such as the construction and testing of a real pulley), which facilitates his understanding.

Moreover, there is a multicompetence development, this is because the unit goes beyond the acquisition of content, boosting a broad spectrum of key competencies. This includes linguistic and multilingual communication competence, STEAM competence through the scientific method, personal, social, and learn to learn competence.

Finally, the last strength is functional linguistic immersion Functional Linguistic Immersion because language is a functional tool for learning and expression in a real context. This allows students to acquire knowledge in an authentic way and use the language to communicate their ideas, reflecting true linguistic immersion.

There is some opportunities we can find in this proposal such as; better adapting the tasks to the different levels in the classroom. This adaptation will allow all students, regardless of their starting point in language or content, to feel successful and maintain motivation to learn, further personalizing the educational experience.

In addition, the proposal is aligned with current educational and employment demands, which value skills such as critical thinking, problem solving, collaboration, and multilingual communication. The development of these future competencies positions students for success beyond the school environment.

However, there are also weaknesses or inner weak points such as; not including peer-assessment, thus losing a valuable tool to encourage reflection, constructive feedback, and the development of student autonomy.

Also, some science concepts may be inherently difficult for the age group. Although visual resources are used, the proposal could benefit from more explicit strategies to simplify concepts that present high cognitive or abstract difficulty.

Another weakness is that there was not enough time to fully develop the unit and test it in its entirety. This implies that some of the strategies and activities may not have been optimized or that their actual effectiveness has not yet been fully validated in practice.

To sum up, there is also some theaths or external negative factors like uneven proficiency in the classroom and lack of methodological continuity. It is true that there is a huge diversity of English levels among students, that can hinder classroom dynamics, learning pace, and equitable participation if not managed with specific strategies. About the methodical continuity, there is nothing more that can be done since it was carried out during my internship and the school tutor has his/her own schedule.

CONCLUSIONS

This project concludes with some findings that validates the efficacy of integrating CLIL with active methodologies I the context of Science for 4th grade Primary Education students.

Firstly, the implementation of CLIL methodology not only facilitates the acquisition of specific knowledge in the area of Science, but also significantly enhances the development of communicative competence in English by immersing students in an environment where English as the vehicle for learning curricular content, an authentic, contextualized and motivating linguistic learning is promoted and at the same time promotes a functional use of the language.

Secondly, the unit proposed shows that active methodologies are fundamental pillars for the success of CLIL teaching. This approach makes learning interactive and engaging by involving students in hands-on tasks, discussions, projects and experiments. Moreover, active methodologies facilitate natural language acquisition along with CLIL by providing a meaningful context, for example when using English to conduct an experiment or discuss a scientific concept, language ceases to be an end and becomes a functional tool.

Thirdly, the project highlights the importance of detailed curricular planning adapted to the needs of the students. The clear definition of specific objectives, the link to key competencies and specific competencies and the consideration of curricular adaptations demonstrate an awareness of diversity in the classroom.

Finally, the formative and summative assessment measures the progress in Science and in English to ensure the viability of the unit. The assessment approach has three levels of achievement (“All children must be able to”, “Most children must be able to” and “Some children must be able to”). The inclusion of rubrics for self-assessment as well as classroom observation implies a holistic view of assessment that goes beyond mere testing of knowledge. The rubrics make possible to identify not only what students know, but also how they apply that knowledge, how they interact and how they develop critical thinking and communication skills in a foreign language.

In summary, this project not only validates the benefits of implementing CLIL and Active Pedagogies in Primary Education but also offers a practical model for teachers seeking to innovate in teaching content through a foreign language.

BIBLIOGRAPHY

Álvarez, A., & Del Río, P. (1990). Educación y desarrollo: la teoría de Vigotsky y la zona de desarrollo próximo. *Desarrollo psicológico y educación*, *2*(0), 93-120.

Ausubel, D. P., Stager, M., & Gaite, A. J. H. (1968). Retroactive facilitation in meaningful verbal learning. *Journal of Educational Psychology*, *59*(4), 250.

Brevik, M., & Moe, E. (2012). Effects of CLIL teaching on language outcomes. *Collaboration in language testing and assessment*, *26*, 213-227.

Bruner, J. S. (1960). The process of education. *The President and Fellows of Harvard College*.

Cálciz, A. B. (2011). Metodologías activas y aprendizaje por descubrimiento. *Revista digital innovación y experiencias educativas*, *7*(40), 1-11.

Chomsky, N. (1998). On the nature, use, and acquisition of language. In *Handbook of child language acquisition* (pp. 33-54). Brill.

Council of Europe. (2001). Common European Framework of Reference for Languages: Learning, teaching, assessment. Cambridge University Press.

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

Council for the Curriculum, Examinations and Assessment (CCEA). (n.d.). *The Northern Ireland Curriculum primary*. https://ccea.org.uk/downloads/curriculum/primary/the-northern-ireland-curriculum-primary

Da Cruz, X. G., de Lis González, M. J. M., & Escudero, G. G. (2015). El rendimiento en lengua inglesa en programas bilingües en España. The NABE Journal of Research and Practice, 6(1).

DECREE 38/2022, of September 29, establishing the organization and the curriculum of primary education in the Community of Castilla y León. https://bocyl.jcyl.es/boletines/2022/09/30/pdf/BOCYL-D-30092022-2.pdf

Department for Education. (2013). *The national curriculum in England: Framework document*. GOV.UK. https://www.gov.uk/government/publications/national-curriculum-in-england-framework-for-key-stages-1-to-4

Dewey, J. (2006). The Child and the Curriculum. *R. Parker-Rees & J. Willan, Early Years Education: Histories and traditions*, 97.

Dobson, A., Murillo, M. D. P., & Johnstone, R. (2010). *Bilingual education project Spain*. Ministerio de Educación.

Gaffney, K. (2020). *Simple Machines*. Raintree.

Gibbs, G. (1981). Teaching Students to Learn: A Student-Centered Approach.

Hamers, J. F., & Blanc, M. (2000). Bilinguality and bilingualism. Cambridge University Press.

Harris, J. (2002). Virtual architecture: Designing and directing curriculum-based telecollaborative projects. *Learning and Leading with Technology*, *27*(7), 42-50

Hewitt, S. (1998). *Forces Around Us*. Children's Press.

Horwitz, E. K. (2000). It Ain't over 'til It's Over: On Foreign Language Anxiety, First Language Deficits, and the Confounding of Variables. The Modern Language Journal, 84(2), 256-259.

Ildefonso y Josu Solabarrieta Eizaguirre, A. V. S. M. P. R. A. G. O. G. M. M. J. A. M. P. J. M. O. M. [a]. I. M. S. (2008). *Competence-based learning: A proposal for assesment of generic competences* (A. V. Sánchez y Manuel Ponlete Ruiz, Ed.). Tuning. http://www.deusto-publicaciones.es/index.php/main/libro/554/es/competence-based-learning

Konopka, C. L., Adaime, M. B., & Mosele, P. H. (2015). Active teaching and learning methodologies: some considerations. *Creative Education*, *6*(14), 1536-1545.

Lee Fields, D., & Marsh, D. (2017). *Echando una mano : 101 técnicas de andamiaje para el profesorado de lenguas desde una perspectiva CLIL (con una sección especial de ELT)*. Ediciones Octaedro.

LOMLOE Organic Law 3/2020, of December 29, which amends Organic Law 2/2006, of May 3, 2006, on Education.

Madinabeitia, S. C. (2007). The integrated curriculum, CLIL and constructivism. *Revista española de lingüística aplicada*, (1), 55-66.

Marsh, D. (2013). *Content and language integrated learning* (*CLIL*). A development trajectory.

Massler, U. (2011). Assessment in CLIL learning. *Guidelines for CLIL implementation in primary and pre-primary education*, 114-136.

Martínez, Á. Á. C. (2019). El enfoque metodológico CLIL (Content and Language Integrated Learning) en la enseñanza primaria: Estudio comparativo de su implementación en un centro bilingüe y en un centro con sección bilingüe. *Revista Nebrija de Lingüística Aplicada a la Enseñanza de Lenguas*, *13*(27), 32-54.

McGrath, D. (2002). Doing projects well. *Learning and Leading with Technology*, *30*(3), 42-50.

Morze, N., Smyrnova-Trybulska, E., & Kopczyński, T. (2023). Assessment and Development of STEAM Competences of Pre-service and In-service Teachers. In Sheehan Eugene P., Köhler Marcel (eds.): Book of Abstracts The 9th International Conference on Education (ICEDU 2023), 16th-17th March 2023 Bangkok, Thailand, 2023, Sri Lanka, The International Institute of Knowledge Management (TIIKM), 256 p., ISBN 978-6 (pp. 31-32). The International Institute of Knowledge Management (TIIKM), Thailand.

Moya, E. C. (2017). Using Active Methodologies: The StudentśView. *Procedia-Social and Behavioral Sciences*, *237*, 672-677

Nikula, T. (2017). CLIL: A European Approach to Bilingual Education. In: Van Deusen-Scholl, N., May, S. (eds) Second and Foreign Language Education. Encyclopedia of Language and Education. Springer, Cham. https://doi.org/10.1007/978-3-319-02246-8_10

Nordlof, J. (2014). Vygotsky, Scaffolding, and the Role of Theory in Writing Center Work. *The Writing Center Journal*, *34*(1), 45–64. http://www.jstor.org/stable/43444147

North, B. (2007). The CEFR illustrative descriptor scales. *The Modern Language Journal*, *91*(4), 656-659.

Nuangchalerm, P., & Thammasena, B. (2009). Cognitive Development, Analytical Thinking and Learning Satisfaction of Second Grade Students Learned through Inquiry-Based Learning. *Asian Social Science*, *5*(10), 82-87.

Nurhidayah, I. J., Wibowo, F. C., & Astra, I. M. (2021). Project Based Learning (PjBL) Learning Model in Science Learning: Literature Review. *Journal Of Physics Conference Series*, *2019*(1), 012043. https://doi.org/10.1088/1742-6596/2019/1/012043

ORDEN, de 5 de abril de 2000, por la que se aprueba el currículo integrado E. Infantil y E. Primaria previsto en el convenio entre en Ministerio de Educación y Cultura y el Consejo Británico en España. *Boletín Oficial del Estado, 105,* 2 de mayo de 2000. https://www.educa.jcyl.es/es/temas/idiomas-bilinguismo/programas-bilingues-secciones-linguisticas/convenio-mefp-the-british-council-cyl/normativa-convenio-mefp-british-council-cyl.ficheros/404923-CURRI%20INTEGRAD%20%283%29.pdf

ORDEN EDU/6/2006, de 4 de enero, por la que se regula la creación de secciones bilingües en centros sostenidos con fondos públicos de la Comunidad de Castilla y León. *Boletín Oficial de Castilla y León, 8,* de 12 de enero de 2006.

https://www.educa.jcyl.es/es/resumenbocyl/orden-edu-6-2006-4-enero-regula-creacion-secciones-bilingue

Oxford, R. L. (2006). Task-based language teaching and learning: An overview. *Asian EFL journal*, *8*(3).

Panasan, N. (2010). Learning Outcomes of Project-Based and Inquiry-Based Learning Activities. *Journal Of Social Sciences*, *6*(2), 252-255. https://doi.org/10.3844/jssp.2010.252.255

Pardjono, P. (2016). Active learning: The Dewey, Piaget, Vygotsky, and constructivist theory perspectives. *Jurnal Ilmu Pendidikan Universitas Negeri Malang*, *9*(3), 105376.

Piaget, J. (1972). Development and learning. *Reading in child behaviour and development*, 38-46.

Siekmann, G., & Korbel, P. (2016). Defining "STEM" skills: review and synthesis of the literature.

Solomon, G. (2003). Project-based learning: A primer. *Technology and Learning*, *23*(6), 20-30.

Soltani, Riad. (2023). CLIL: Bridging the Gap Between Language and Content. Central European Journal of Educational Research. 5. 10.37441/cejer/2023/5/2/12489.

Tang, K. S. (2019). The role of language in scaffolding content & language integration in CLIL science classrooms. *Journal of Immersion and Content-Based Language Education*, *7*(2), 315-328.

Universidad de Valladolid. (2010). *Memoria de Plan de Estudios del Título de Grado Maestro -o Maestra- en Educación Primaria*.

Verhelst, N., Van Avermaet, P., Takala, S., Figueras, N., & North, B. (2009). Common European Framework of Reference for Languages: learning, teaching, assessment. En *Cambridge University Press eBooks*. https://biblio.ugent.be/publication/627466

Vilaplana, R., Hyder, A., & Gomis, O. (2010). *Working in terms of competences: activities designed using active methodologies*. INTECH Open Access Publisher.

Walker, S. E. (2003). Active learning strategies to promote critical thinking. *Journal of athletic training*, *38*(3), 263.

Westwood. (2006). *Learning through inquiry: A handbook for teachers*.

APPENDICES

APPENDIX I

SPECIFIC COMPETENCES

These specific competences are extracted from the LOMLOE´s Spanish curriculum and are traduced to English by me.

Specific competence 1

1.1 Search and organise information about natural environment using digital tools according to the educational context in a safe way.

Specific competence 2

2.1 Formulate questions and make predictions showing curiosity and respect for the natural environment

2.2 Search and select information from different safe and reliable sources to use in their investigations acquiring new vocabulary.

2.3 Conduct guided experiments using different models and techniques in a safe and accurate manner.

2.4 Propose answers to formulated questions about natural environment interpreting the information or comparing previous predictions.

2.5 Present the results of the investigations in several formats using scientific vocabulary and explaining the steps.

Specific competence 3

3.1 Build as a team a final product that gives a solution to a design problem obtaining practical solutions.

3.2 Present a final product in a variety of formats and explaining the steps.

Specific competence 5

5.1 Identify and analyse the characteristics, organisation and properties of elements of the natural environment using adequate tools and procedures.

APPENDIX II

<table>
<tr><th colspan="3">About the unit/ Where this unit fits</th></tr>
<tr><td colspan="3">This educational unit will be developed in a public school in Palencia. It is set for 4th grade in a class of 25 students. It fits into the Natural Sciences curriculum and will work on content related to understanding forces and their applications. It will develop curiosity and problem-solving skills. The unit develops the objectives of the Sustainable Development Agenda (SDA). Methodological aspects of CLIL will be integrated, combining the areas of Science and a foreign language. To this end, English will be a channel, a way, through which the contents of Science will be developed. In addition, the methodology will be active, seeking to make the resolution of tasks the general dynamic of the sessions. Also, cooperative learning will be key in the development of the sessions, promoting student autonomy and teamwork.</td></tr>
<tr><th>Prior Learning</th><th>Language used in the unit</th><th>Important Resources</th></tr>
<tr><td>• Work in pairs and groups.
• Practice respect towards others.
• Follow instructions carefully.
• Respect talking during group discussions.
• Forces push, pull and lift
• Types of energy</td><td>Present simple tense and imperative sentences will be used to facilitate the transmission of the message. In addition, a color code will be used to identify the grammatical nature of the words.

It will introduce verbs that are needed for the instructions of different tasks by using active dynamics and commands. That verbs must be:</td><td>• Digital board
• Projector
• Science books
• Observation sheets
• Experiment sheets
• Booklets
• Cardboards
• Pencils
• Markers</td></tr>
<tr><th colspan="3">Expectations</th></tr>
<tr><td>At the end of this unit all the children must</td><td colspan="2">• Identify different simple machines.
• Build simple machines.
• Conduct experiments to test hypotheses.
• Collect data.
• Test results with different variables.
• Collect results with different variables.</td></tr>
<tr><td>At the end of this unit most of the children should</td><td colspan="2">• Visually identify different simple forces.
• Test the operation of simple machines with different variables.
• Employ simple force transfer processes: lever, pulley, etc.
• Correctly use comparative adjectives (not sentences).</td></tr>
<tr><td>At the end of this unit some of the children could</td><td colspan="2">• Transfer forces using simple machines.
• Form comparative adjectives.
• Design projects to solve daily life problems.</td></tr>
</table>

Lessons Overview				
Lesson	Learning goals	Learning outcomes	Main activity	Assessment criteria
1	• Identify the forces • Identify what are simple machines	• Identify the forces and simple machines • Understand how forces work • Understand that simple machines use forces	Debate about what do they know about the forces and simple machines and what do they want to know.	• Formulate at least one question about the topic • Talk about what they know about the topic • Identify the forces and the simple machines
2	• Identify the forces in daily life objects • Follow the scientific method	• Relate some objects with the force that can be applied over them • Follow the scientific method making hypotheses, taking notes of the results and making conclusions	The students will experiment with different objects to explore concepts like push, pull, gravity, and friction.	• Follow the scientific method • Take notes of the results • Identify the forces in daily life objects
3	• Identify magnetism and gravity forces in daily life	• Define what is a non-contact force • Describe magnetism and gravity • Observe magnetism and gravity forces though an experiment	The students experiment with different object so see gravity and magnetism. They see that objects fall at the same speed (gravity) and magnetism properties.	• Define what is a non-contact force • Describe magnetism and gravity
4	• Identify the forces and their effects	• Relate the properties of the objects with how forces affect them	Identify and test the effects of the forces in some objects. The forces make objects move or stop, they can change the shape of some objects or broke them.	• Identify the forces and their effects • Register the results • Relate the properties of the objects with how forces affect them
5	• Identify simple machines (pulley, lever and inclined plane) • Follow instructions	• Explain how simple machines work • Construct and test models of simple machines • Follow and give instructions	The students build simple machines (pulley, lever and inclined plane) and test the machines with different variables taking notes of the results.	• Identify simple machines (pulley, lever and inclined plane) • Follow instructions • Construct and test models of simple machines
6	• Identify the four types of energy	• Describe the four types of energy • Explain how energy works	The students brainstorm about energy and then investigate about	• Identify the four types of energy

		• Identify the sources of each energy type	four types of energy (mechanical, light, electric and chemical).	• Describe the four types of energy • Explain how energy works • Identify the sources of each energy type
7	• Learn about greatest inventions and their impact in our daily lives	• Investigate about inventions and their impact in our daily lives • Present in an organised way the results of the investigation	The students investigate about greatest inventions and why are they important. Then they have a presentation of the inventions.	• Search for information • Present the topic • Work in groups • Use vocabulary related to inventions
8	• Design a final product to solve a problem	• Demonstrate what they have learn in the unit applying the contents into a design project • Present a final product	The students think about needs they have (or about a given situation) and invent some new machine. Then they explain its purpose and how it is used.	• Recall types of energy • Recall contact forces and non-contact forces • Give ideas to solve problems • Present a final product

<table>
<tr><th colspan="6">Lesson #1 What do I know?</th></tr>
<tr><td colspan="2">Learning objectives</td><td colspan="2">Learning outcomes</td><td colspan="2">Evidence for Assessment</td></tr>
<tr><td colspan="2">• Identify the forces
• Identify what are simple machines</td><td colspan="2">• Identify the forces and simple machines
• Understand how forces work
• Understand that simple machines use forces</td><td colspan="2">• Poster about forces and simple machines (What do I know)
• Systematic observation</td></tr>
<tr><td colspan="2">Discourse/Text targeted</td><td colspan="4">Language targeted- Non-verbal Language Targeted</td></tr>
<tr><td colspan="2">Text level:
• Expository text
• Instructional text
Sentence level:
• Simple grammar
• Present simple
• Imperative sentences
• Short sentences
• Simple questions
Word level:
• Word bank: push, pull, lift, gravity, magnetism, contact forces and non-contact forces, simple machines, wheel, pulley and lever.
• Building vocabulary
• Spelling-pronunciation</td><td colspan="4">Public speech:
• Making decisions in a group
• Answer to simple questions
Private speech:
• Decision-making
• Express thoughts and feelings
Inner speech:
• Thoughts about what are forces
• Emotions
Verbal thought:
• Problem-solving (taking decisions related to the topic)</td></tr>
<tr><td colspan="6">Outline of leading activities</td></tr>
<tr><td colspan="6">Students debate about what do they know about the forces and simple machines and what do they want to know. They formulate some questions to solve what they don´t know and watch a video that will solve some of their questions. Finally, they will have to compare what do they knew before the videos and what do they know after.</td></tr>
<tr><td></td><td>Timing</td><td>Grouping</td><td>Pupils</td><td>Teacher</td><td>Resources</td></tr>
<tr><td>Classroom Management</td><td>5 min</td><td>All the students</td><td>The students listen to the teacher and thinks about the topic.</td><td>Introduces the topic of the unit and explains the main activity.</td><td></td></tr>
</table>

	10 min	All the students	The students discuss what do they know about the topic. And plan questions to the concepts they don´t know: How many forces are? What is a lever? How many simple machines are? …	Guides the debate asking some questions and leading the students to ask questions themselves (about what they know or not)	• Pencil • Piece of paper
	10 min	5 groups of 5	The students write the questions that they have formulating during the debate and plan more if they want to know more about the topic.	Divides the students into five groups of five students, to discuss what do they know about the topic.	• Pencil • Piece of paper
	20 min	5 groups of 5	The students will investigate some books about the topic, to gather information to be able to answer the questions that they have formulated.	Teacher gives the students scientific books about the topic (that answer the questions that the teacher has predicted) that will provide more information about the topic.	• Scientific books • Pencil • Piece of paper
	10 min	5 groups of 5	The students answer the questions they have planned with the added information and elaborate some conclusions. They write the conclusions in a cardboard under the title: FORCES AND SIMPLE MACHINES: What do I know.	Explains the activity and guide students to elaborate conclusions.	• Pencil • Piece of paper • Cardboard • Markers
	5 min	5 groups of 5	The students share what do they know about forces and simple machines.	The teacher listens to the students while is taking notes in the observation sheet of the lesson.	• Cardboard

Assessment Criteria		
All children must be able to	Most of the children will be able to	Some of the children could

• Formulate at least one question about the topic • Talk about what they know about the topic • Identify the forces and the simple machines	• Formulate more than one question about the topic • Write simple sentences about the topic	• Elaborate a complete conclusion comparing what do they know before and after the lesson

Lesson #2 We explore contact forces		
Learning objectives	Learning outcomes	Evidence for Assessment
• Identify the forces in daily life objects • Follow the scientific method	• Relate some objects with the force that can be applied over them • Follow the scientific method making hypotheses, taking notes of the results and make conclusions	• Experiment sheet with the objects, prediction, results and conclusion • Systematic observation
Discourse/Text targeted	Language targeted- Non-verbal Language Targeted	
Text level: • Expository text • Instructional text **Sentence level:** • Simple grammar • Present simple • Imperative sentences • Short sentences • Simple questions **Word level:** • Word bank: push, pull, lift and contact forces. • Building vocabulary • Spelling-pronunciation	**Public speech:** • Making decisions in a group • Answer to simple questions **Private speech:** • Decision-making • Express thoughts and feelings **Inner speech:** • Thoughts about the forces • Emotions **Verbal thought:** • Problem-solving (taking decisions related to the topic)	
Outline of leading activities		
The lesson starts with s review of the previous lesson. Then the students will experiment with different objects to explore concepts like push, pull, lift, and friction. At the end of the lesson the students relate the objects with the forces.		

Classroom Management	Timing	Grouping	Pupils	Teacher	Resources

	10 min	5 groups of 5	The students remember what their conclusions of the previous lesson were.	The teacher reviews what the previous lesson and introduces the new one.	• Cardboard posters
	25 min	5 groups of 5	First the students write which force they think will act over each object. Then the students try to move different objects and see which forces in each case. Then register it into an experiment sheet and elaborate some conclusions.	The teacher explains the activity, distributes the objects, and establish turns so each group can text every object.	• Experiment sheet • Pencil • Table • Chair • Rope • Bottle of water • Box • Toy Car
	10 min	5 groups of 5	The students review what force is related with which object according with their conclusions.	The teacher guides the students to extract the conclusions of what force is related with which object.	Experiment sheet
	15 min	All the students	The students play a game in the digital board that relates some objects with the forces seen in the lesson.	The teacher projects a game about the forces seen in the lesson to review the content.	• Projector • Digital board • Game
Assessment Criteria					
All children must be able to			Most of the children will be able to		Some of the children could

• Follow the scientific method • Take notes of the results • Identify the forces in daily life objects • Work in groups	• Relate some objects with the force that can be applied over them • Talk about predictions • Use vocabulary related to contact forces	• Write predictions • Extract conclusions

Lesson #3 Exploring non-contact forces (magnetism and gravity)		
Learning objectives	Learning outcomes	Evidence for Assessment
• Identify magnetism and gravity forces in daily life	• Define what is a non-contact force • Describe magnetism and gravity • Observe magnetism and gravity forces though an experiment	• Experiment sheet • Systematic observation
Discourse/Text targeted	Language targeted- Non-verbal Language Targeted	
Text level: • Expository text • Instructional text **Sentence level:** • Simple grammar • Present simple • Imperative sentences • Short sentences • Simple questions **Word level:** • Word bank: non-contact forces, repel, field, force attract and gravity. • Building vocabulary • Spelling-pronunciation	**Public speech:** • Making decisions in a group • Answer to simple questions **Private speech:** • Decision-making • Express thoughts and feelings **Inner speech:** • Thoughts about the non-contact forces • Emotions **Verbal thought:** • Problem-solving (taking decisions related to the topic)	
Outline of leading activities		
The lesson starts with some questions to remember the previous lesson and to introduce the new topic. Then the students experiment with different object so see gravity and magnetism. At the end of the lesson the students review what have they learned.		
Timing Grouping Pupils Teacher Resources		

Classroom Management	15 min	All the students	The students recall what they learn in the previous lesson and think what can be the answer of the teacher´s questions.	The teacher asks questions about the previous lesson to remember the contact forces. Then introduces the lesson´s topic: non-contact forces with some questions. What makes things fall to the ground? What makes magnets stick to the fridge? The teacher makes some examples with magnets and throwing different objects to the ground.	
	10 min	All the students	The students answer the questions with their previous knowledge and learn about the new concepts.	The teacher introduces the concepts of magnetism and gravity: • Introduce the concept of magnetism with two magnets: same magnetic poles repel or push each other, and different magnetic poles attract or pull together. • Explain the concept of gravity: with different objects (paper, pencil and book) and asking questions: What will fall faster the pen or the book?	• Two magnets • Paper • Pencil • Book
	30 min	5 groups of 5	First the students write which objects they think are magnetic. Then the students try to move different objects and see which ones are magnetic or not. Then register it into an experiment sheet and elaborate some conclusions.	The teacher explains the activity, distributes the objects, and establish turns so each group can text every object.	• Five magnets • Aluminium foil • Keys • Coins • Paper clips • Pencil • Ruler • Experiment sheet
	5 min	All the students	The students share what they have register and elaborate a summary of the lesson about the forces and their effects.	The teacher guides a summary of the lesson about the contact forces.	• Observation sheet

Assessment Criteria		
All children must be able to	Most of the children will be able to	Some of the children could
• Observe magnetism and gravity forces though an experiment • Identify magnetism and gravity forces in daily life • Work in groups	• Use vocabulary related to the topic • Describe magnetism and gravity	• Define what is a non-contact force • Describe magnetism and gravity with simple sentences

Lesson #4 The forces and their effects		
Learning objectives	Learning outcomes	Evidence for Assessment
• Identify the forces and their effects	• Understand how forces make objects change shape • Understand how forces can make things start or stop moving • Understand that forces can break objects	• Observation sheet (what happens to each object)
Discourse/Text targeted	Language targeted- Non-verbal Language Targeted	
Text level: • Expository text • Instructional text **Sentence level:** • Simple grammar • Present simple • Imperative sentences • Short sentences • Simple questions **Word level:** • Word bank: broke, shape, move, stop, ductile, plasticine, rubber, … • Building vocabulary • Spelling-pronunciation	**Public speech:** • Making decisions in a group • Answer to simple questions **Private speech:** • Decision-making • Express thoughts and feelings **Inner speech:** • Thoughts about the properties of the forces in different objects • Emotions **Verbal thought:** • Problem-solving (taking decisions related to the topic)	
Outline of leading activities		

The lesson starts with some questions: What does objects move or stop? What does objects break? What does objects change shape? The questions are answered with some demonstrations. Then the students have some time to test the effects of the forces in some objects. The lesson ends with a summary of the forces and their effects.

	Timing	Grouping	Pupils	Teacher	Resources
Classroom Management	10 min	All the students	The students recall what they learn in the previous lesson and think what can be the answer of the teacher´s questions.	The teacher asks the students about the previous lesson and introduces the new lesson with three questions: What does objects move? What does objects break? What does objects change shape?	
	10 min	All the students	The students explain what happens to the objects according to the questions the teacher formulated at the start of the lesson.	The teacher demonstrates what happen to some objects.	• Rubber • Ball • Cart
	30 min	5 groups of 5	The students will test different objects to see what happen to them. They change shape, they broke, they start moving or stop moving. Then they register the results in an observation sheet.	The teacher organises the distribution of the objects within the groups.	• Observation sheet
	10 min	5 groups of 5	The students share what they have register and elaborate a summary of the lesson about the forces and their effects.	The teacher guides a summary of the lesson about the forces and their effects.	• Observation sheet

Assessment Criteria

All children must be able to	Most of the children will be able to	Some of the children could
• Understand how forces make objects change shape • Understand how forces can make things start or stop moving • Understand that forces can break objects • Identify the forces and their effects • Register the results • Identify at least one effect of the forces in the objects	• Identify three effects of the forces in some objects • Use vocabulary related the forces	• Identify the three effects of the forces in most of the objects • Relate the properties of the objects to how forces affect them

Lesson #5 Simple machines, simpler life		
Learning objectives	Learning outcomes	Evidence for Assessment
• Identify simple machines (pulley, lever and inclined plane) • Follow instructions	• Explain how simple machines work • Construct and test models of simple machines • Follow and give instructions	• Models • Systematic observation
Discourse/Text targeted	Language targeted- Non-verbal Language Targeted	
Text level: • Expository text • Instructional text **Sentence level:** • Simple grammar • Present simple • Imperative sentences • Short sentences • Simple questions **Word level:** • Word bank: pulley, inclined plane, lever, force, load and effort. • Building vocabulary • Spelling-pronunciation	**Public speech:** • Making decisions in a group • Answer to simple questions **Private speech:** • Decision-making • Express thoughts and feelings **Inner speech:** • Thoughts about the properties of the forces in different objects • Emotions **Verbal thought:** • Problem-solving (taking decisions related to the topic)	

Outline of leading activities

The lesson starts with a review of the precious lesson, to introduce the new topic. Then the students divide into smaller groups and build simple machines (pulley, lever and inclined plane). Later, the students test the machines (every group test all the machines) with different variables and take notes of the results. At the end of the lesson, the students share the results of their testing and elaborate conclusions.

Classroom Management	Timing	Grouping	Pupils	Teacher	Resources
	10 min	All the students	The students recall what they learn in the previous lesson and think what can be the answer of the teacher´s questions.	The teacher asks questions about the previous lesson to remember it and introduces the new topic. How do we move heavy objects? What tools do we use?	
	35 min	3 groups of 8 (one of 9)	The students distribute in three groups and build one machine. Then, test it and take notes. They can try different improvements and move a variety of objects.	The teacher explains the activity, distributes the objects, and establish turns so each group can text every machine. The first group in each machine stand hast to build the machine.	• Wooden plank • Toy car • Pulley • Pencil • Long ruler • Paper sheet
	15 min	All the students	The students share what happened during their testing and observation and explain how simple machines work.	The teacher guides and helps students explain what happened during their testing and observation.	• Observation sheet

Assessment Criteria		
All children must be able to	Most of the children will be able to	Some of the children could

• Identify simple machines (pulley, lever and inclined plane) • Follow instructions • Construct and test models of simple machines • Work in groups	• Explain how simple machines work • Suggest at least one improvement for the machines • Use vocabulary related to machines	• Follow and give instructions • Explain how machines help us • Suggest improvements for the machines

Lesson #6 The energy of machines		
Learning objectives	Learning outcomes	Evidence for Assessment
• Identify the four types of energy	• Describe the four types of energy • Explain how energy works • Identify the sources of each energy type	• Cardboard • Presentation • Systematic observation
Discourse/Text targeted	Language targeted- Non-verbal Language Targeted	
Text level: • Expository text • Instructional text **Sentence level:** • Simple grammar • Present simple • Imperative sentences • Short sentences • Simple questions **Word level:** • Word bank: energy, electric, mechanical, light, chemical, fuels, sun, cables, motion, …	**Public speech:** • Making decisions in a group • Answer to simple questions **Private speech:** • Decision-making • Express thoughts and feelings **Inner speech:** • Thoughts about the properties of energy • Emotions **Verbal thought:** • Problem-solving (taking decisions related to the topic)	

• Building vocabulary • Spelling-pronunciation	

Outline of leading activities

The lesson starts with a review of the precious lesson, to introduce the new topic. Then the students brainstorm about energy and then investigate about four types of energy (mechanical, light, electric and chemical). The lesson ends with the presentation of the four types of energy.

	Timing	Grouping	Pupils	Teacher	Resources
Classroom Management	10 min	All the students	The students recall what they learn in the previous lesson and brainstorm about energy.	The teacher asks questions about the previous lesson to remember it and introduces the new topic. Then, writes ENERGY in the board and students recall their previous knowledge, giving ideas or words related to the topic. Finally, shows examples of the four types of energy and which objects use each energy.	• Chalks • Board • Pictures
	30 min	4 groups of 6 (one of 7)	The students examine the pictures they found in the class (one type of energy per group). Then define and describe how energy is used, giving examples.	The teacher distributes the groups and assigns an energy type for each group. Also, provides resources to help the students investigate about their topic.	• Pictures of devices • Sheet with sentences • Cardboard
	20 min	4 groups of 6 (one of 7)	The students present what they know about their energy.	The teacher evaluates the student's presentation.	• Cardboard

Assessment Criteria

All children must be able to	Most of the children will be able to	Some of the children could
• Identify the four types of energy • Identify the sources of each energy type • Present the results to the class • Work in groups	• Describe the four types of energy • Use vocabulary related to energy	• Explain how energy works • Write simple sentences describing the energy and how it works

Lesson #7 Greatest inventions		
Learning objectives	Learning outcomes	Evidence for Assessment
• Learn about greatest inventions and their impact in our daily lives	• Investigate about inventions and their impact in our daily lives • Present in an organised way the results of the investigation	• Presentation • Systematic observation
Discourse/Text targeted	Language targeted- Non-verbal Language Targeted	
• Expository text • Instructional text **Sentence level:** • Simple grammar • Present simple	**Public speech:** • Making decisions in a group • Answer to simple questions **Private speech:** • Decision-making • Express thoughts and feelings	

• Imperative sentences • Short sentences • Simple questions **Word level:** • Word bank: printing press, steam engine, electricity, radio, computer, coal, steam, … • Building vocabulary • Spelling-pronunciation	**Inner speech:** • Thoughts about the inventions and why are they important • Emotions **Verbal thought:** • Problem-solving (taking decisions related to the topic)

Outline of leading activities

The lesson starts with a review of the previous lesson and connecting it to the new topic. Then the students investigate about greatest inventions and why are they important. The lesson ends with the presentation of the inventions.

Classroom Management

Timing	Grouping	Pupils	Teacher	Resources
10 min	All the students	The students recall what they learn in the previous lesson and then think about greatest inventions, and which energy does them use.	The teacher asks questions about the previous lesson to remember it and introduces the new topic. By asking questions about energy and what can it be used for; like for machines. The teacher proposes the students to think about machines and greatest inventions like telephone and why where them important.	
30 min	5 groups of 5	The students research about important inventions such as the internet or the radio and why they changed history.	The teacher distributes the groups and assigns an energy type for each group. Also, provides resources to help the students investigate about their topic.	• Booklets with the basic information of each invention.
20 min	5 groups of 5	The students present what they know about their inventions.	The teacher will project on the digital board an image of the invention that each group is going to present.	• Digital board • Projector

Assessment Criteria		
All children must be able to	Most of the children will be able to	Some of the children could
• Search for information • Present the topic • Work in groups	• Use vocabulary related to inventions • Summarise the information • Present clearly and with an adequate voice tone	• Organise the information in an obvious way • Present with an adequate voice tone looking to the audience

Lesson #8 Machines in our daily life		
Learning objectives	Learning outcomes	Evidence for Assessment
• Design a final product to solve a problem	• Demonstrate what they have learn in the unit applying the contents into a design project • Present a final product	• Systematic observation • Students' projects
Discourse/Text targeted	Language targeted- Non-verbal Language Targeted	
• Expository text • Instructional text **Sentence level:** • Simple grammar • Present simple • Imperative sentences • Short sentences • Simple questions **Word level:** • Word bank: printing press, steam engine, electricity, radio, computer, coal, steam, … • Building vocabulary • Spelling-pronunciation	**Public speech:** • Making decisions in a group • Answer to simple questions **Private speech:** • Decision-making • Express thoughts and feelings **Inner speech:** • Thoughts about the machines that are around us • Emotions **Verbal thought:** • Problem-solving (taking decisions related to the topic)	
Outline of leading activities		
The lesson starts with a review of the precious lesson, to introduce the new topic. Then the students will identify what machines do they see and use in their daily life. They must think about needs they have (or about a given situation) and invent some new machine. Finaly, they explain its purpose and how it is used.		

Timing	Grouping	Pupils	Teacher	Resources

Classroom Management	1 5 min	All the students	Recall which inventions did they research and think about the machines they use in their daily life.	The teacher asks about the inventions in the students presented in the previous lesson and asks the students about which machines do they use in their daily life.	
	25 min	5 groups of 5	The students think about a new machine that solve/helps with some daily life problems. They must design it, think about how it works, and which force or energy does it use.	The teacher makes the groups and hep the students to think about problematic situations that can be solved with the machines.	• Piece of paper • Pencils • Cardboards • Crayons • Markers
	20 min	5 groups of 5	The students present what their inventions.	The teacher evaluates the final product of the unit.	• Cardboards

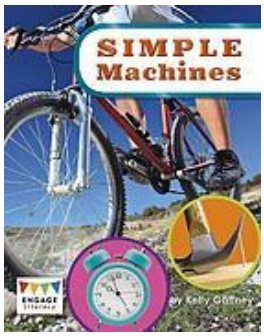
Assessment Criteria

All children must be able to	Most of the children will be able to	Some of the children could
• Know at least two types of energy • Know what a contact force is and non-contact force and give examples • Give ideas about problems that can be solved with machines • Present a final product	• Propose ideas to solve a problem • Relate the forces with real life machines • Think about which energy does the machine uses	• Put into practice what they learn in the unit applying the concepts seen in the design of the machine

APPENDIX III

BOOKS ABOUT FORCES AND SIMPLE MACHINES

Gaffney, K. (2020). *Simple Machines*. Raintree.



Hewitt, S. (1998). *Forces Around Us*. Children's Press.

APPENDIX IV

EXPERIMENT SHEETS FORCES (PUSH, PULL AND LIFT)

PUT PUSH, PULL OR LIFT

OBJECT	PREDICTION	RESULT

CONCLUSIONS

APPENDIX V

WORDWALL GAME (PUSH, PULL AND LIFT)

https://wordwall.net/resource/89485807

APPENDIX VI

EXPERIMENT SHEET (MAGNETISM)

IT IS MAGNETIC OR NOT

OBJECT	PREDICTION	RESULT
		
		
		
		
		

CONCLUSIONS

APPENDIX VII

EXPERIMENT SHEET (FORCES AND THEIR EFFECTS)

PUT PUSH, PULL OR LIFT

OBJECT	PREDICTION	RESULT
		
		
		

CONCLUSIONS

APPENDIX VIII

PICTURES OF ENERGY

APPENDIX IX

OBSERVATION TABLES

Date:			Lesson 1: What do I know?					
Aim of the lesson:								
Assessment criteria			Students					
			Student 1	Student 2	Student 3	Student 4	Student 5	Student 6
Behaviour	Actively participates in activities							
	Helps peers during activities							
Assessment Criteria	All children must be able to	Formulate one question about the topic						
		Talk about the topic						
		Identify the forces and simple machines						
	Most of the students must be able to	Formulate more than one question						
		Write simple sentences about the topic						
	Some of the children could	Elaborate a conclusion						
		Write complete sentences about the topic						
Lesson Observations								
Classroom Management (fights, lesson finished earlier or later, tables display, etc)								
Improvements								

Date:			Lesson 2: We explore contact forces					
Aim of the lesson:								
Assessment criteria			Students					
			Student 1	Student 2	Student 3	Student 4	Student 5	Student 6
Behaviour	Actively participates in activities							
	Helps peers during activities							
Assessment Criteria	All children must be able to	Follow the scientific method						
		Identify the forces						
		Take notes of the results						
		Work in groups						
	Most of the students must be able to	Use vocabulary related to contact forces						
		Relate objects with forces						
		Talk about predictions						
	Some of the children could	Write predictions						
		Extract conclusions						
Lesson Observations								
Classroom Management (fights, lesson finished earlier or later, tables display, etc)								
Improvements								

Date:			Lesson 3: Exploring non-contact forces					
Aim of the lesson:								
Assessment criteria			Students					
			Student 1	Student 2	Student 3	Student 4	Student 5	Student 6
Behaviour	Actively participates in activities							
	Helps peers during activities							
Assessment Criteria	All children must be able to	Identify magnetism and gravity						
		Work in groups						
	Most of the students must be able to	Define what is a non-contact force Describe magnetism and gravity						
		Use vocabulary related to the topic						
	Some of the children could	Describe magnetism and gravity with simple sentences						
		Define what is a non-contact force						
Lesson Observations								
Classroom Management (fights, lesson finished earlier or later, tables display, etc)								
Improvements								

Date:			Lesson 4: The forces and their effects					
Aim of the lesson:								
Assessment criteria			Students					
			Student 1	Student 2	Student 3	Student 4	Student 5	Student 6
Behaviour	Actively participates in activities							
	Helps peers during activities							
Assessment Criteria	All children must be able to	Identify forces and their effects						
		Understand the effects of the forces						
		Register the results						
	Most of the students must be able to	Identify the effects of the forces in one object						
		Use vocabulary related to the topic						
	Some of the children could	Relate the properties of the objects to how forces affect them						
		Identify the tree effects in different objects						
Lesson Observations								
Classroom Management (fights, lesson finished earlier or later, tables display, etc)								
Improvements								

Date:			Lesson 5: Simple machines, simpler life					
Aim of the lesson:								
Assessment criteria			Students					
			Student 1	Student 2	Student 3	Student 4	Student 5	Student 6
Behaviour	Actively participates in activities							
	Helps peers during activities							
Assessment Criteria	All children must be able to	Identify simple machines						
		Construct and test models of simple machines						
		Follow instructions						
		Work in groups						
	Most of the students must be able to	Explain how simple machines work						
		Suggest at least one improvement for the machines						
		Use vocabulary related to the topic						
	Some of the children could	Follow and give instructions						
		Suggest more than one improvement						
		Explain how machines help us						
Lesson Observations								
Classroom Management (fights, lesson finished earlier or later, tables display, etc)								
Improvements								

Date:			Lesson 6: The energy of machines					
Aim of the lesson:								
Assessment criteria			Students					
			Student 1	Student 2	Student 3	Student 4	Student 5	Student 6
Behaviour	Actively participates in activities							
	Helps peers during activities							
Assessment Criteria	All children must be able to	Identify the four types of energy						
		Identify the energy sources						
		Present the results to the class						
		Work in groups						
	Most of the students must be able to	Describe the four types of energy						
		Use vocabulary related to the topic						
	Some of the children could	Explain how energy works						
		Write simple sentences describing energy and how it works						
Lesson Observations								
Classroom Management (fights, lesson finished earlier or later, tables display, etc)								
Improvements								

Date:			Lesson 7: Greatest inventions					
Aim of the lesson:								
Assessment criteria			Students					
			Student 1	Student 2	Student 3	Student 4	Student 5	Student 6
Behaviour	Actively participates in activities							
	Helps peers during activities							
Assessment Criteria	All children must be able to	Search for information						
		Present the topic						
		Work in groups						
	Most of the students must be able to	Summarise the information						
		Present clearly with an adequate voice tone						
		Use vocabulary related to the topic						
	Some of the children could	Organise the information in an obvious way						
		Present looking to the audience						
Lesson Observations								
Classroom Management (fights, lesson finished earlier or later, tables display, etc)								
Improvements								

Date:			Lesson 8: Machines in our daily life					
Aim of the lesson:								
Assessment criteria			Students					
			Student 1	Student 2	Student 3	Student 4	Student 5	Student 6
Behaviour	Actively participates in activities							
	Helps peers during activities							
Assessment Criteria	All children must be able to	Know at least two types of energy						
		Know what contact forces and non-contact forces are						
		Give ideas of problems that can be solved by machines						
		Work in groups						
	Most of the students must be able to	Propose ideas to solve problems						
		Relate the forces with real life machines						
		Think about which energy does the machine uses						
	Some of the children could	Put into practice what they have learned in the unit by applying the concepts in each scenario						
Lesson Observations								
Classroom Management (fights, lesson finished earlier or later, tables display, etc)								
Improvements								

APPENDIX X

ORAL PRESENTATION EVALUATION RUBRIC

Group : ..... **Lesson 7:Greatest Inventions**

	NOT ACHIEVED (1)	**NEEDS TO IMPROVE** (2)	**ACHIEVED** (3)	**SCORE** (1, 2 OR 3)
INFORMATION	They don´t say when or who invented the machine.	They say when or who invented the machine. They don´t say why was it important.	They say when or who invented the machine. They say why was it important.	
ORGANISATION OF THE INFORMATION	Wrong information about the topic. The information does not make sense.	One data is wrong or the organisation of the inoformation is confusing.	All the information is correct. The information is clear and organised.	
PRESENTATION (Speaking)	They only read the paper. The voice tone is too low.	They only read the paper or he voice tone is too low.	They read the paper and looks to the audience. Their voice tone is good.	

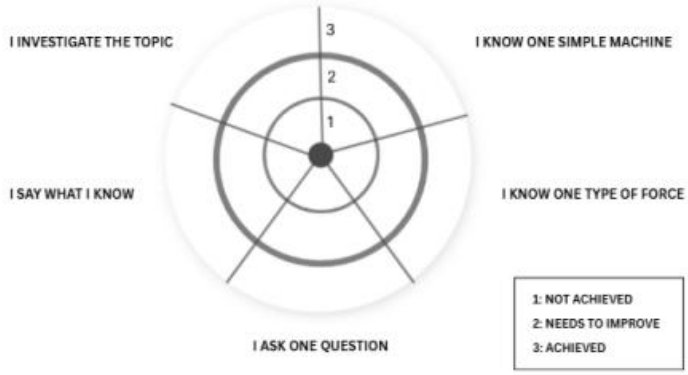
Group : ..... **Lesson 8: Machines in our daily life**

	NOT ACHIEVED (1)	**NEEDS TO IMPROVE** (2)	**ACHIEVED** (3)	**SCORE** (1, 2 OR 3)
PROBLEM/ SOLUTION	They use something that already exist or adapt something already created.	They have planed a new machine, that adapts to the problem they proposed.	They have planed a new machine, that can be useful.	
DESIGN	The machine they designed doesn´t uses one of the forces studied or one of the types of energy studied.	The machine they designed only uses one of the forces studied or one of the types of energy studied.	The machine they designed uses one of the forces studied and one of the types of energy studied.	
PRESENTATION	They only read the paper. The voice tone is too low. They made everithing in Spanish.	They only read the paper or he voice tone is too low. They use mostly english, but some parts in Spanish.	They read the paper and looks to the audience. Their voice tone is good. They make everything in English.	

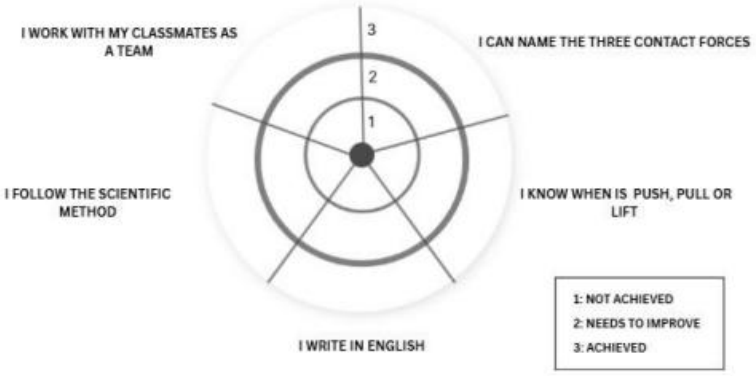
APPENDIX XI

SELF-ASSESMENT AND PEER ASSESSMENT EVALUATION TARGET

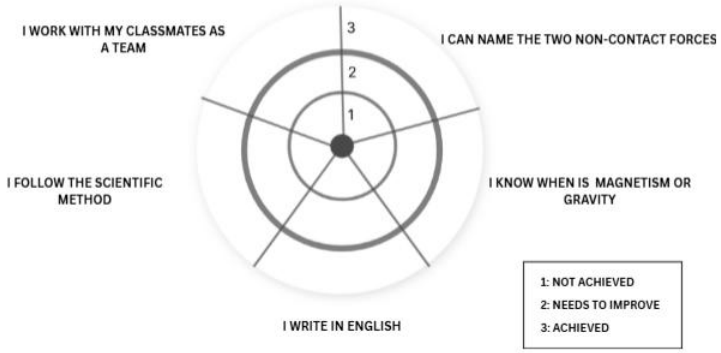
Lesson 1: What do I know?



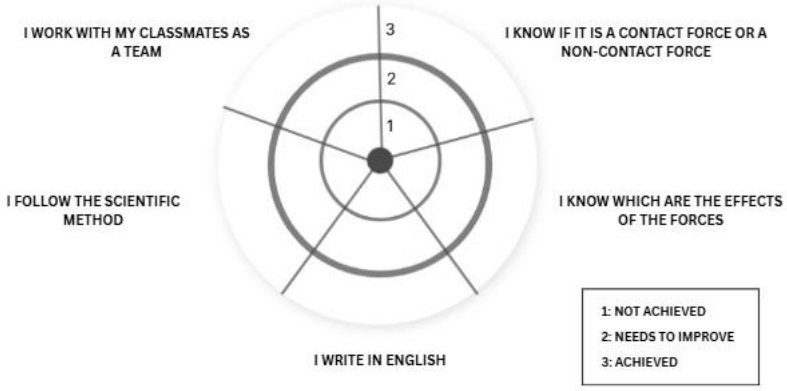
Lesson 2: We explore contact forces



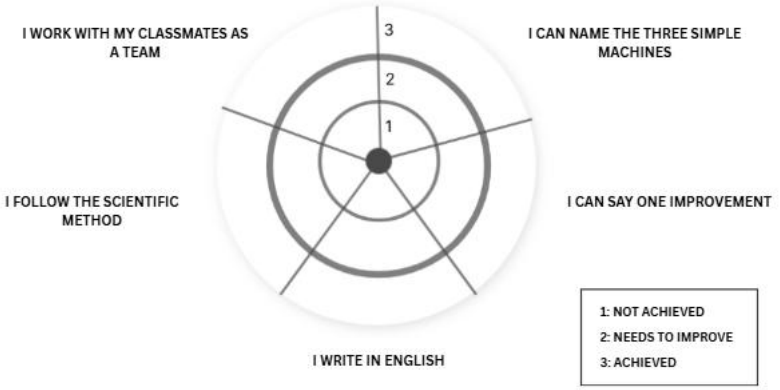
Lesson 3: Exploring non-contact forces



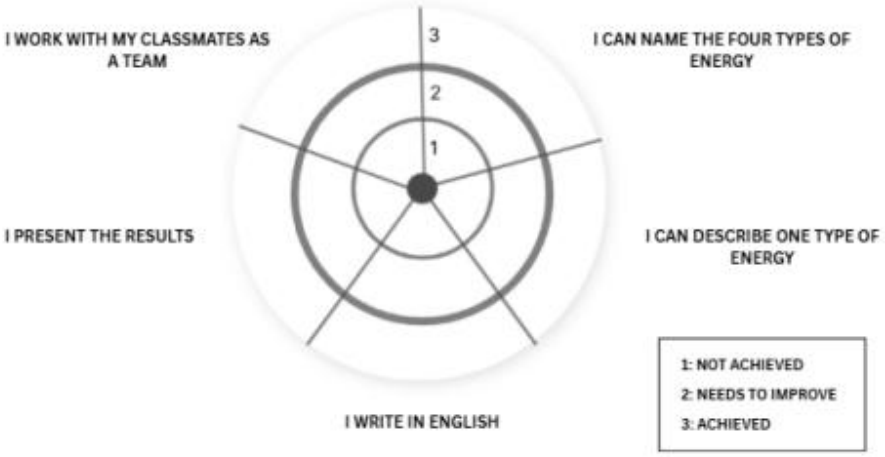
Lesson 4: The forces and their effects



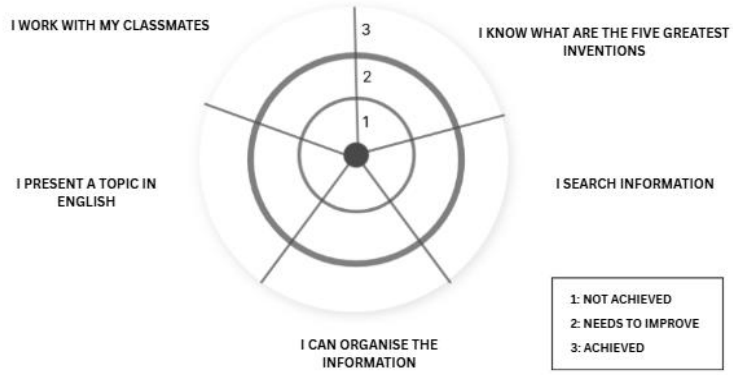
Lesson 5: Simple machines, simpler life



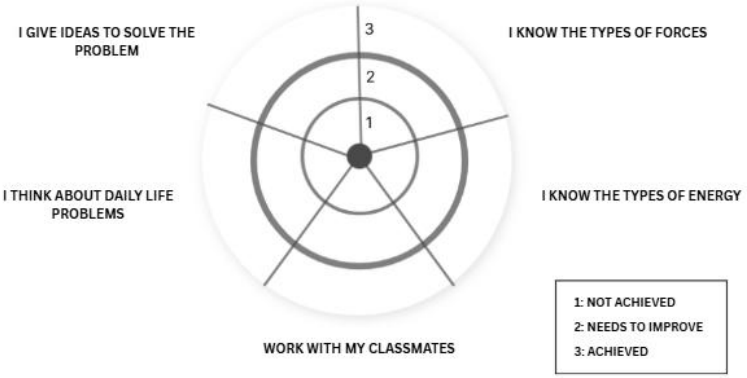
Lesson 6: The energy of machines



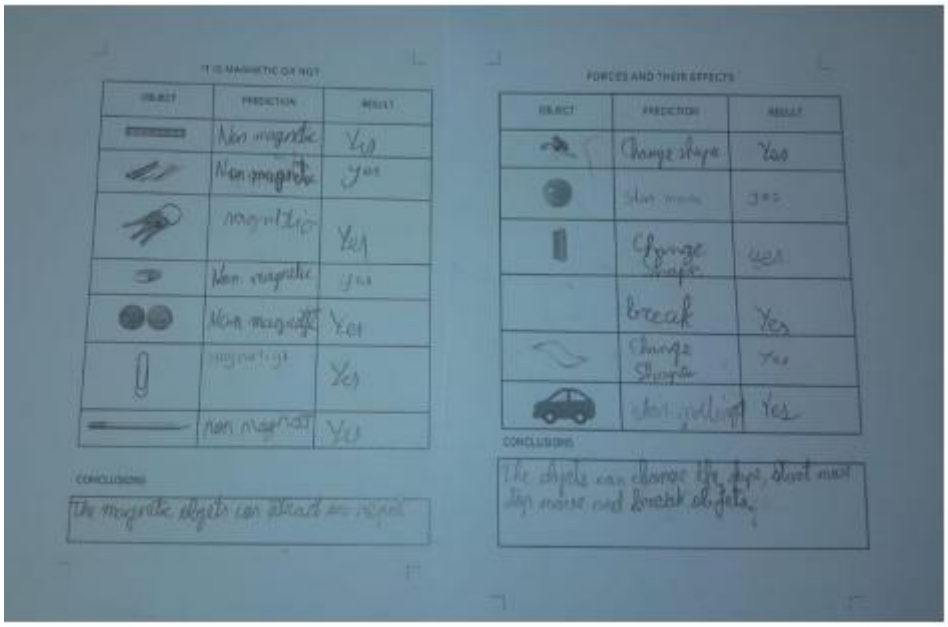
Lesson 7: Greatest inventions



Lesson 8: Machines in our daily life



APPENDIX XII



IT IS MAGNETIC OR NOT

OBJECT	PREDICTION	RESULT
	Non magnetic	Yes
	Non magnetic	yes
	magnetic	Yes
	Non. magnetic	yes
	Non magnetic	Yes
	magnetic	Yes
	non magnetic	Yes

CONCLUSIONS

The magnetic objects can attract ... [illegible]

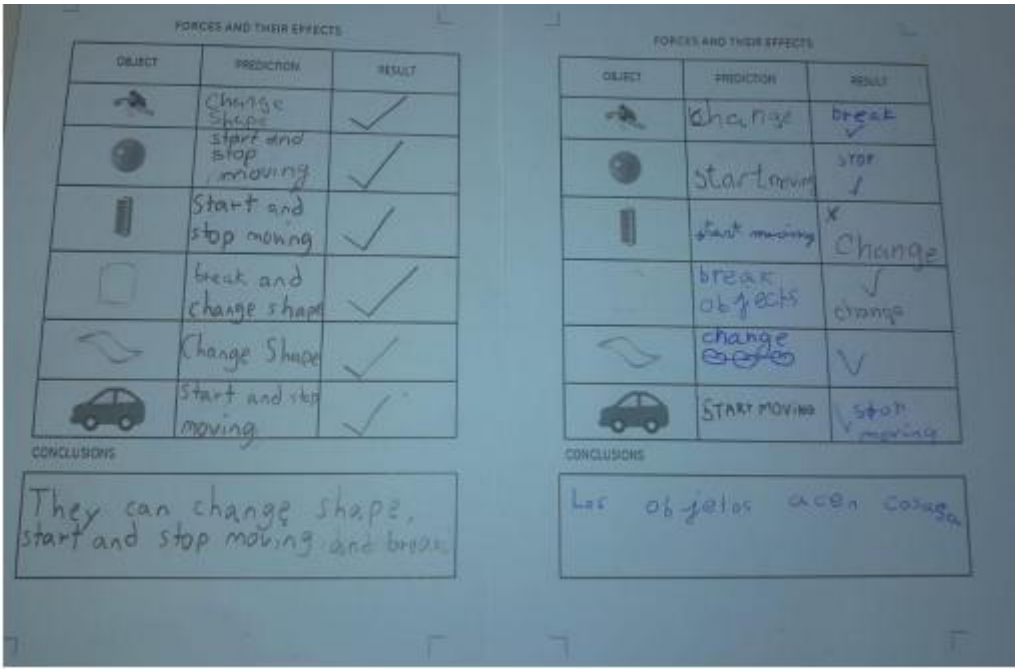
FORCES AND THEIR EFFECTS

OBJECT	PREDICTION	RESULT
	Change shape	Yes
	Start move	yes
	Change shape	yes
	break	Yes
	Change shape	Yes
	start moving	Yes

CONCLUSIONS

The objets can change the shape, start and stop move and break objets.

APPENDIX XIII



FORCES AND THEIR EFFECTS

OBJECT	PREDICTION	RESULT
	Change Shape	✓
	start and stop moving	✓
	Start and stop moving	✓
	break and change shape	✓
	Change Shape	✓
	Start and stop moving	✓

CONCLUSIONS

They can change shape, start and stop moving and break

FORCES AND THEIR EFFECTS

OBJECT	PREDICTION	RESULT
	change	break ✓
	start moving	stop ✓
	start moving	✗ Change
	break objects	✓ change
	change	✓
	START MOVING	stop moving

CONCLUSIONS

Los objetos acen cosas