

**FINAL DISSERTATION**

**How the teachers' perceptions affect the Science  
CLIL teaching**

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## **Abstract**

The need to explore new innovative teaching methods fostered the discovering of CLIL. Its implementation was the result from a long process of changes and modifications in the teaching-learning processes at schools but the importance about the new role that the language acquired in order to promote a bilingual society contributed to its development. Even though it can be applied in many subjects, the Science area was the first one as the students need to use and explore the language in significant contexts not only focused on the contents but also in the learning of other aspects of the language. In this context, the perceptions that teachers have regarding the Science teaching and, in this case the English teaching, influence the CLIL practice in the classrooms. In order to analyze these perceptions, four different teachers have been interviewed and many sessions have been observed to contrast the coherence between the opinions and thoughts of the teachers with the practice. It can be affirmed that even though teachers have the principles of CLIL in mind, they are not always reflected in the teaching performance.

**Key words:** CLIL, case study, teachers' perceptions, Science Education.

## **Resum**

La necessitat d'explorar nous mètodes innovatius va donar lloc al descobriment de l'AICLE. La seva implementació va ser el resultat d'un llarg procés de canvis i modificacions en els processos d'ensenyament-aprenentatge de les escoles però la seva importància al voltant del rol que juga el llenguatge per tal de promoure una societat bilingüe va permetre el seu ràpid desenvolupament. Encara que pot ser aplicat a una gran diversitat d'assignatures, l'àrea de Ciències va ser una de les primeres pel fet que els estudiants han d'utilitzar i explorar el llenguatge en contextos significatius no només centrats en els continguts sinó també en l'aprenentatge d'altres aspectes de la llengua. En aquest context, les percepcions que els i les mestres tenen sobre l'ensenyament de les ciències i, en aquest cas sobre l'ensenyament de l'anglès, influeixen la pràctica AICLE a l'aula. Per tal de fer un anàlisi d'aquestes percepcions s'han entrevistat quatre mestres diferents i s'han observat diverses sessions per tal de contrastar la coherència de les opinions i pensaments dels i les mestres amb la pràctica a l'aula. Es pot afirmar que encara que els mestres tinguin clars els fonaments de l'AICLE, no sempre es veuen reflectits quan es posen a la pràctica.

**Paraules clau:** AICLE, estudi de casos, percepcions dels mestres, ensenyament-aprenentatge, ciències.

## **Resumen**

La necesidad de explorar nuevos métodos innovadores dio lugar al descubrimiento del AICLE. Su implementación fue el resultado de un largo proceso de cambios y modificaciones en los procesos de aprendizaje de las escuelas pero su importancia alrededor del papel que juega el lenguaje para promover una sociedad bilingüe permitió

su rápido desarrollo. Aunque puede ser aplicado en una diversidad de asignaturas, el área de Ciencias fue una de las primeras por el hecho de que los estudiantes tienen que utilizar y explorar el lenguaje en distintos contextos significativos no solo centrados en los contenidos sino también en el aprendizaje de otros aspectos de la lengua. En este contexto, las percepciones que los maestros y maestras tienen en relación al enseñanza de las ciencias y, en este caso sobre el enseñanza de la lengua inglesa, influyen en la práctica AICLE. Para poder realizar un análisis de estas percepciones se han entrevistado cuatro maestras distintas y se han observado distintas sesiones para contrastar la coherencia de las opiniones y pensamientos de los maestros y maestras con su práctica en el aula. Se puede afirmar que aunque las bases del AICLE son asimiladas y conocidas por los maestros y maestras, no siempre se ven reflejadas en la práctica docente.

**Palabras clave:** AICLE, estudio de casos, percepciones de los maestros, enseñanza-aprendizaje, ciencias.

## **1. Introduction**

The increasing interest and attraction for an innovative methodological approach that started to grow in the 1990s, Content and Language Integrated Learning (CLIL), emerged because the role of the language became different and remarkable at the same time that relevance had been given to the learning of foreign languages to foster a multilingualism community. It is an approach that was first settled in few schools as it implied many rearrangements and challenges that needed to be considered before setting it up because it “implies a more integrated approach to both teaching and learning, requiring that teachers should devote special thought not just to how languages should be taught, but to the educational process in general“ (European Commission, 2005, p.7)..

Despite the fact that CLIL can be applied in a wide range of subjects at school, the ones “that are most frequently taught through CLIL approach are Social Sciences, Natural Sciences, PE and Arts and Crafts” (Muñoz, 2007, p.163). One of the main reasons might be because in Science, “students need to actively use words and explore in language-rich classrooms that focus not only on the content but also on learning vocabulary” (Fathman and Crowther, 2006, quoted by Shanahan, T., and Shea, L., 2012, p.411-412). As the students are exposed to real and meaningful contexts, language becomes the main source of communication to transfer and construct the knowledge, which is one of the main aims of CLIL.

Having in mind all these elements, the object of study of this research wants to focus on teachers because they are one of the main pillars to transform our society introducing, changing or innovating the teaching practices at schools. The purpose of this study is to see how teachers' perceptions around Science teaching as well as English teaching influence the CLIL practice in Primary Education classrooms focusing on the Science area. In this way, it can be possible to realize and identify if what they think is coherent with what they do.

As “we have a great diversity in the implementation of CLIL programs” (Martínez, 2011, p.99) applied in many schools, it is determining to research about it as it is an innovative approach that influences the education system of our future citizens.

In general terms, this methodology involves “both the non-language subject and the language in which this is taught, attaching the same importance to each” (European Commission, 2005, p.7) and it requires a hard work regarding decision making. These decisions are taken by the teachers that are the ones who will configure their lessons. As Duschl (1990) stated, it is important to analyze them because “right or wrong, appropriate or not, a teacher makes numerous decisions on a daily basis and [...] an effective decision maker considers the learner, the learning environment, and the nature of the subject matter” (p.2). The decisions directly influence the development of the session as every person decides them depending on their knowledge, their objectives and the things that are relevant from their point of view. It is interesting to see how these thoughts and decisions influence the practice in the classrooms, even more when we talk about an innovative approach.

Having in mind the main objective of the research, this study wants to give an answer to the following specific research questions:

1. What are the teachers' perceptions regarding the Science teaching?
2. What are the teachers' perceptions regarding the English teaching?
3. What are the teachers' perceptions regarding CLIL?
4. How is CLIL put into practice taking into account these statements?

## **2. Theoretical framework**

### **2.1 General overview of CLIL**

CLIL refers to an innovative methodological approach whose roots were founded in the same decade when a “discussion of language learning in the European institutions led to realization of the need to explore innovative teaching methods” (European Commission, 2005, p.8). Within these settings, it needs to be understood as a methodology that wants to foster the learning of languages as well as other areas of the curriculum simultaneously. When students are exposed to a CLIL class, they are expected to learn the language in which the subject is taught, in this case focusing on English, as well as the contents of the subject itself, in this case the Science area. Since it was first launched in the European Union, it has been a phenomenon characterized by a fast development.

Even though there is a great diversity when it comes to implement CLIL programs at schools, they all “share the aim of achieving communicative competence in second and foreign languages across the curriculum” (Martínez, 2011, p.99). In other words, the theoretical bases of this method were arranged but it was implemented in many different ways depending on every context and perspective that it gathered.

Its implementation requires a gradual process as all the challenges “require the use of human resources (specialist teachers) and suitable teaching materials to a significantly greater extent than conventional school language teaching” (European Commission, 2005, p.51). As mentioned before, awareness about advantages and disadvantages that might arise during the process need to be taken into account before setting it up. As it is an innovative methodology, it implies to build up another way of teaching and learning that differs from the one used until now and it takes time.

Embarking on CLIL is quite demanding for teachers as they “should devote special thought not just to how languages should be taught, but to the educational process in general” (European Commission, 2005, p.7). Teachers are the ones who need to change their mentalities from scratch regarding the general idea about the learning process that previously had about education. Moreover, most authorities highlight the importance of having further qualifications as well as the necessary skills to ensure the language competence needed to promote CLIL in the classrooms. In this way, effort makes the improvement through “a continual process of formation from the time when they were

in school” (Mellado, Blanco and Ruiz, 1998, p.196). Teachers need to be updated and the necessity to be trained before carrying a new methodology out is possible through the participation in some teaching training courses that can help to give them the necessary tools to carry out CLIL. At the same time, these courses focus on “the competences that this approach requires and they develop not only knowledge of the language but also its integrated use with content” (Calle, 2015, p.16) as this is the main basis of this approach. The intention is to give teachers the tools they need to apply it taking into account their previous experience and their knowledge both from the subject and the language that it is used.

It seems to be that when doing Science, language is the principal way in which the scientific concepts are understood. The speech enhances relevant discussions that are complemented with feedback. It is in these situations when the students need to use the language in a real and significant context. In this way, we can affirm that “CLIL and Science have some pedagogical aspects in common, which inter-relate and generate an ideal learning matrix” (Linares, 2016, p.24).

In this way, Coyle designed “the 4Cs framework for CLIL” (communication, culture, content and cognition) to understand how all the elements are connected and how the integrated learning is build up. While curricula of science education as well as the curricula of the foreign language are taught, the students are involved in a communication and cognition process that helps to learn and integrate both things. As Figure 1 shows, a successful CLIL lesson should combine content

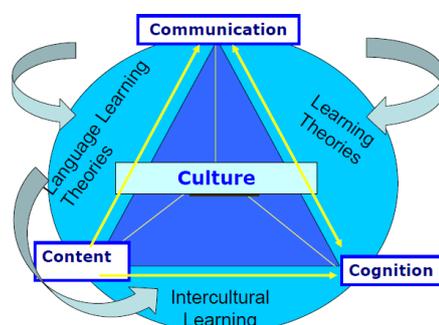


Figure 1: Coyle 4Cs framework matrix for CLIL

(knowledge about the subject), communication (using language to build up the knowledge), cognition (developing thinking skills) and culture (the exposure of other points of view). It is through the use of these parameters that content and language will be integrated in the learning process.

## 2.2 The bases of Science in Science Education

What makes Science different from the other fields of knowledge is the coherence between observations and explanations, in other words, a scientific explanation must be

coherent with the data obtained through the observation. As Krajcik and Czerniak (2014) stated that “humans created science to predict, explain, and understand events and phenomena in the natural world. These predictions and explanations are dependent upon the ideas or, more formally, the theories and models that scientists have developed that are consistent with observations”(p.10). At the same time, these theories and models help us to build up explanations about the world and phenomena that surrounds us thanks to the observation as well as the evidences. As Jiménez (2000) stated, “science needs to be understood as an interpretation process of the reality through the construction of models that can be substituted by others” (p.175). In this way, “when theories can no longer explain and make predictions, humans create new theories to replace the old ones. The new theory explains everything the old theory does but also accounts for observations that the old theory could not explain” (Krajcik and Czerniak, 2014, p.10). This is the reason why reality can be seen in many ways depending on the models that each person is based on. As a result of this process, a scientific model comes out. But what really needs to be considered is the fact that “doing science is not only about “doing experiments” but also proposing and discussing ideas, evaluating different alternatives and choosing between a wide range of explanations” (Jiménez, 2000, p.182).

As it can be noticed above, doing Science involves social processes that can be taught, learnt and applied to a community. Science is a social, cognitive and manipulative activity that generates knowledge about the natural phenomena. Having in mind these ideas, it is needed to consider that “students in science classes ask questions and try to find solutions that will help them explain their world. Students engage in Science in the same ways that scientists engage in Science” (Krajcik and Czerniak, 2014, p.12). In addition, students need to assemble knowledge to understand the world in which they live so they act as scientists because they try to see and explain the phenomena in the world to understand it while expanding their knowledge at the same time.

Almost 20 years of discussion were needed to agree on what school science should consist of. “Science did not become accepted at school level until the late nineteenth century” (Lawson and Silver, 1973, quoted by Ward et al., 2005, p.7). As every subject, there was not a unique way of organize a science lesson in Primary School and the learning basis needed to be established; not only from a methodological point of view but also regarding teachers and students attitudes towards it.

The first thing that should be taken into account is the way in which it is conceived as Science ”involves a completely new educational planning from the conception of science as a social interpretation of the reality or as a method itself”<sup>1</sup> (Sanmartí, 2003, p.63). For this reason, it needed to be planned and discussed accurately as many decisions were supposed to be agreed before carrying it out. One of the main “objectives in the Science teaching is the thinking development” (Jiménez, 2000, p.172) that in this case uses the language as the main tool to make it visible. Learning Science is “controlling the scientific processes and through their application, the students will arrive to discover the knowledge” (Jiménez, 2000, p.172). We teach them to investigate, organize and coordinate experimental activities to let them discover how the world works.

Harlen, Macro, Reed and Schilling (2003) highlighted that what really influences the management of each lesson is the age of the students. The contents and the learning objectives are completely different depending on this fact in each case. Moreover, “learners need to be provided with both the opportunity and the time to engage with the processes and the procedures of science in order to develop sound knowledge and understanding” (Ward et al., 2005, p.9). Students’ attitudes towards Science are relevant because they directly affect and influence the way in which they engage with it. Time is needed because being involved in Science in English is challenging as well as demanding.

In a Science class, “it is important to value the ideas that children express and encourage them, not only to express and share these ideas, but also to try to explain their basis, or origin” (Harlen et al., 2003, p.16). Making them explain the origin or the basis of their explanations, their previous ideas as well as mental schemes will come out. In this way, all the students can share their mental schemes when a topic is presented. These are built up through perception, quotidian experience, imagination, conversation... and lead to explain phenomena, making questions about it as well as possible predictions that need to be discovered. Sanmartí (2003) stated that “in order to understand a phenomena or an event, each person mentally constructs representations that allow the

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<sup>1</sup> “conlleva un planteamiento educativo totalmente distinto al de la concepción de la ciencia como interpretación social de la realidad o al de ciencia entendida tan sólo cómo método” (Sanmartí, 2003, p.63).

manipulation, the reasoning and the discussion about them”<sup>2</sup> (p.64). Keeping in mind this idea, it cannot be forgotten that each child comes to class with different mental schemes so teachers should encourage them to express, explore and verify these ideas through Science.

In this way, “children’s understanding is likely to change most effectively if they are encouraged to investigate further what they think they know and to test, for themselves, whether their ideas can be consistently applied” (Harlen et al., 2003, p.16). Teachers should take advantage of these situations so that they can encourage students to go further and find the answer to their interests, curiosities and questions about their own findings through an appropriate environment.

As a suitable environment is essential in order to play with students ideas, “it is necessary [...] to create a dynamic that students simultaneously active the “thinking”, “doing” and “talking” about facts and phenomena of the natural and physical world”<sup>3</sup> (Sanmartí, 2003, p.63). Conversations as well as discussions are essential in these cases because it will help the students to change their initial ideas. “Students seem to perceive how good a science teacher is according to the social climate generated in the classroom” (Tobin & Fraser, 1990, quoted by Mellado et al., 1998, p.202). So, they will be exposed to different experiences characterized by more or less quality depending on how good the teacher is. Krajcik and Czerniak (2014) also added that “students need experiences and guidance in collaborating. [...] It is important to introduce students gradually to collaboration” (p.155). Once these initial mental schemes come out, teachers need to provide experiences in which the students can prove their predictions.

Moreover, within the experience, guidance from the teacher is needed because the students’ first skills will be limited and might be misunderstood so the teacher needs to enhance the development of these skills and push them to mature so that they can see the world from another perspective. “The teacher must give real choices, be a role model, select the curriculum carefully, promote a positive attitude toward science, promote affective factors, maintain a balanced teacher-student relationship, and ensure quality” (Krajcik and Czerniak, 2014, p.294). If teachers have in mind all these things,

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<sup>2</sup> “cada individuo, para entender un fenómeno o evento, construye mentalmente representaciones que le permiten manipularlos a nivel mental y hablar y razonar sobre los mismos” (Sanmartí, 2003, p.64).

<sup>3</sup> “es necesario [...] crear una dinámica que active simultáneamente el “pensar”, el “hacer” y el “hablar” de los escolares sobre los hechos y fenómenos del mundo natural y físico” (Sanmartí, 2003, p.63).

every experience that they provide to their students will help them to relate their mental constructions with the whole learning process that will become meaningful and will let them mature.

On the one hand, what cannot be forgotten is the fact that “knowledge of the material to be taught is essential for primary teachers” (Mellado et al., 1998, p.5) as some of them do not feel prepared enough to carry out these type of lessons and if teachers have a low level of knowledge regarding the subject, there is an obstacle that will directly affect the teaching and the whole learning process of the students. On the other hand, if they have the sufficient knowledge, they will be able to focus on the necessities that each child might need instead of focusing on what it is explained because there is not enough confidence and security to carry it out.

Moreover, the students need to obtain data, analyze it and establish some facts. To do that, some models will be agreed and some evidences will be found. At the end, what the students will observe will be coherent with what they imagine. At this point, they will start questioning their initial ideas and their mental schemes will start to be modified by the evidences they will get. To build up the new model all together, the type of questions needed is so specific and contextualized regarding the object of study.

Little by little, the students will be able to interiorize the knowledge and it will become more abstract. In order to build up this new model, it is needed to agree on the explanations shared with all the class. To do that, we need to recover the facts obtained and discuss them.

Finally, it is needed to make sure that they understood the object of study so teachers need to build up a completely new context in which the students need to apply what they have learnt. In this way, it can be seen if they have interiorized and learnt from the whole project.

### **2.3 Didactic models in Science teaching**

Much relevance has been given to the formation that teachers should receive when it is time to implement an innovative approach, especially using a methodology that has never been implemented before. It is thought that extra knowledge should be provided and learnt before starting to carry it out. In the 80s', the didactic knowledge that each teacher should have about the subjects that are going to be taught, Pedagogical Content

Knowledge (PCK), has been revised. PCK “appeared as a theoretical method useful for the reflection of the professional knowledge necessary for teachers to teach science”<sup>4</sup> (Amat, Vallbona and Martí, 2017, p.4932).

This method was first used regarding other areas to describe the didactic knowledge that teachers had and to reflect about it. When we focus on CLIL, Amat, Vallbona and Martí (2017) believe that “PCK models for the science teaching regarding Primary Education teachers should be revised or extended for the special case of CLIL teachers because they generate teaching-learning processes and situations that differ from other foreign language subjects and science subjects itself”<sup>5</sup> (p.4932). Pedagogical Content Knowledge should always be taken into account particularly focusing on CLIL teachers. The situations they create as well as the development of the class are so different from other subjects and many things that other subjects do not need to face with are involved in these cases. This is why PCK model should be taken into consideration in this special case because teachers’ thinking directly influences their performing in class and this depends on the model they use according to their point of view.

A science teaching model is “a structured plan to configure a curriculum, design materials and orientate the teaching in general” (Joyce and Weil, 1985, quoted by Jiménez, 2000, p.168). Every proposal made for a teacher is based on some pedagogical and psychological bases that configure a model. There is a variety of models and the “strategies that configure a model can be perfectly combined with strategies for another model” (Jiménez, 2000, p.169). This means that when a certain model is applied in class, it might contain strategies or characteristics of another type of model. To specify a little bit more, there are three models in relation with the learning of concepts: transmission and reception, discovering and constructivist<sup>6</sup> (Jiménez, 2010).

The transmission and reception model focuses on the “authority, the book and the teacher. The concepts and theories are presented in a justification context without any relation with the problem itself” (Jiménez, 2000, p.170). The tradition has always been

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<sup>4</sup> “aparece como un modelo teórico útil para la reflexión sobre el conocimiento profesional necesario de los maestros para la enseñanza de las ciencias” (Amat, Vallbona and Martí, 2017, p.4932).

<sup>5</sup> “los modelos de CDC para la enseñanza de las ciencias de maestros de primaria debería ser revisado y/o ampliado para el caso especial de los docentes AICLE, porque general unos procesos de enseñanza y aprendizaje distintos a los de las didácticas de la lengua extranjera y de las ciencias por separado” (Amat, Vallbona and Martí, 2017, p.4932).

<sup>6</sup> El modelo de transmisión-recepción, el modelo de descubrimiento y el modelo constructivista de aprendizaje. (Jiménez, 2010).

there and it still has a lot of presence at schools. Some teachers find it difficult to innovate and they are held on the traditional learning. The students will acquire the knowledge as the teacher understands it because the main aim of this model is the “typical lesson in which the teacher explains and the teachers take notes” (Jiménez, 2000, p.170-171). In this way, the students only act in the way they are taught by the teacher and they assume a passive attitude.

The discovery model appeared because of the failing of the traditional model. According to Piaget, “the best way for a child to learn is through things that they can “invent”, that are discovered by themselves because the knowledge is constructed by the realization of activities” (Jiménez, 2000, p.172). In this case, the role of the teacher is being in charge of the coordination about the experimental activities, providing them opportunities to invest, making them intervene and promoting meaningful contexts accompanied with meaningful experiences that help the students to develop their investigation abilities. What is assessed is the “capacity of using the knowledge in completely new situations and many steps are designed to measure the acquisition of the skills like classifying, predicting, identifying variables, etc” (Jiménez, 2000, p.174). As it can be seen, what is evaluated is the whole process.

Finally, the constructivist model focuses on the construction of the knowledge in which “the students’ ideas are the starting point of the instruction. [...] In the sequence we can find the exploration of ideas, the reconstruction of the knowledge, the introduction of new ideas and the application of these ideas to completely new contexts” (Jiménez, 2000, p.174-175). This is why the students’ are the protagonists of their own learning process. The role of the teacher is flexible and needs to adapt the activities when necessary according to the starting point that comes out by the pupils. The construction of this knowledge, at the same time, is done through many interactions among the others that, at the same time, promote the cooperative learning as well as a dialogue in which they are all comfortable enough to share their ideas. Moreover, “the assessment is done taking into account the concepts but also the abilities, the knowledge they have learnt and the capacity to apply it to the resolution of new problems” (Jiménez, 2000, p.176).

All in all, we need to have in mind that a perfect model useful for everything does not exist. From Jiménez (2000) point of view, “the teaching vocation is related with the

increasing control of a variety of models as all the teachers need to face a wide range of problems” (p.184).

### **3. Methodology**

This research was based on the interpretative paradigm as the main aim was to analyze the teachers’ perceptions about the English teaching and Science teaching as well as the way it influences the CLIL implementation in the classroom. The interpretation of these perceptions was done through the collection of their opinions, discussions, points of view and their corresponding performances in class.

This paper analyzes three different cases taking into account the research questions. The way in which every teacher thinks directly influences the teaching performance and this is why the qualitative methodology has been used as it is the examination of a number of cases through interviews and observations to gather the information needed.

#### *School contexts and participants*

This case study was carried out in three different contexts: two of them from Catalonia and one of them from Finland. Before choosing the schools and the teachers, some parameters needed to be considered: a) the school must be working on a CLIL project in the Science area; b) the grade of the students should be almost the same and c) the location of the schools in order to provide opportunities to observe and interview as many times as necessary. After searching a variety of schools from my area that could accomplish these parameters, two Catalan public schools were chosen. A brief summary of these parameters can be found in the table below (Figure 2).

The reason why the third case is a Finnish school is because this year my last internship has been abroad and the school in which I went was working on CLIL projects for more than twenty years. As experience was also taken into account and the context was completely new, it seemed to be the perfect chance to learn from another education system that also works with CLIL.

In all the schools, the CLIL Science Projects were carried out with 5<sup>th</sup> and 6<sup>th</sup> graders so these were the groups that I could observe.

| Schools                       | School 1  | School 2                                   | School 3                        |
|-------------------------------|---|--|---------------------------------|
| Location of the schools       | Catalonia   | Catalonia                                  | Finland                         |
| Academic year of the students | Mixed groups: 5 <sup>th</sup> and 6 <sup>th</sup> graders | 6 <sup>th</sup> graders                    | 5 <sup>th</sup> graders         |
| Topic observed                | Ecosystems and our forest is alive                        | Living things, non-living things and cells | Solar System                    |
| Type of teacher               | English teacher specialist                                | English teacher specialist                 | English teacher specialist      |
| Subject                       | Science   | Science                                    | Environmental Studies (Science) |
| Number of observations        | 2   | 2  | 2                               |
| Interview                     | Yes (two teachers)  | Yes (one teacher)                          | Yes (one teacher)               |

Figure 2: parameters took into account for the teachers and the schools choice.

In order to gather the data, two instruments had been used: the semi-structured interviews, which were focused on the first three research questions to analyze the teachers' perceptions and the observations which were focused on the last research question in order to contrast the perceptions with the practice in class.

The interviews were considered to be done before the observations as getting their perceptions, opinions and discussions before carrying out the sessions would be useful for the subsequently analysis. Verifying if what they think and mention in the interview is what they really do in class required to collect the data in this way.

When planning the interview, each question was thought to be linked with one of the research questions so that it would be useful to analyze it later on and in this way, any of the objectives would be missed. In addition, the idea was not focused on the reproduction of the theoretical knowledge that teachers already know about the topic and this is why all the questions were thought to involve their interaction, thinking, reflection, discussion, giving opinions, choosing and deciding things while giving a justification to support their ideas. The use of their knowledge instead of the reproduction about general concepts that are written in the books was prioritized.

As the interest of the interview was placed in the interviewee's point of view, an accurate and detailed analysis has been done from every answer gathered. As I was looking for specific information, I created a table so that I could extract the main ideas from each answer and place them into the corresponding research question square from the table (see Figure 3). In this way, I had the classification of the specific information needed in a

visual and organized way. In addition, a brief summary of each answer was included in the table to make the answers clearer. This step was useful in order to contrast the opinions from all the teachers interviewed.

#### **4. Results and discussion**

In this section the three cases will be presented in the following way: they are introduced by a title that summarizes the general idea got from the observations as well as the interviews and it is divided in three different parts (Science, English and CLIL) that are exposed, analyzed and contrasted regarding the coherence between what they had said in the interview and the participant observation of the sessions.

**School 1 (teachers 1 and 2):** The language and the content are equally worked and the main aim is that students have fun while learning and taking profit of each situation that is proposed.

##### *Science vision through the interview*

Both teachers understand Science not only focusing on the experimentation as they affirmed that it can be done in many ways. As their focus is the scientific model, they participated in some formation courses with Jordi Martí that helped them to improve the way of teaching. They started doing Science “with project-based learning and unconsciously, we were already doing this observation and investigation thing”.

From the formation they received and their previous experience, their way of teaching science follows the subsequent structure: an exploratory activity followed by the experimentation part and ending by the communication and reflection part of the learning process through a mind map to structure all the knowledge learnt through the project.

##### *Science vision through the observation*

The observations were done in the 5<sup>th</sup> and 6<sup>th</sup> grade as in this school the Science subject is done with mixed-aged groups. The topic in which they were working on was the ecosystems and there were two teachers in the class.

As it was mentioned in the interview, both teachers build up the sessions starting by a general overview about the tasks that they are going to do, following by an experimentation activity, a discussion in which the ideas and findings are shared and ending up with the creation of a poster including the information learnt each day. Moreover, the tasks were going on from the most theoretical to the most practical and the difficulty was a little bit higher in each activity so they were applying what they said in the interview.

#### *English vision through the interview*

Both teachers always try to involve all the basic skills in their lessons as some of them are more challenging and demanding for the students than others and they all need to be worked by the use of the scaffolding.

Their aim is to work on the language in a natural context. “If some contents of English are needed, they are done independently of their age. English is real because if they need it, we work the things that emerge from the activities”. When the students have questions, doubts or interest for some aspects of this language to communicate, it is worked without any problems because they take advantage of the situation to teach some English language.

#### *English vision through the observation*

Listening and speaking were the skills that they highlighted the most in the interview. It was coherent with the practice as listening and speaking were present in all the tasks while writing and reading were used as a support.

Teachers speak in English all the time providing the support that is needed and the students are in a constant exposure to the language while they were learning Science contents.

Even though teachers do not force the students to speak in English, they encourage them to do so. In order to make the amount of vocabulary available for the students, they prepare it in advance and they hang it in the wall of the class for the whole project.

#### *CLIL vision through the interview*

The main objective for them is that the students can take profit of the lesson while learning and having fun. When it comes to CLIL, contents and language need to be integrated in a meaningful context. So, “content has to be there because it is so important but we try to put a lot of language to it”.

When it is time to plan, they choose one topic from the selected ones taken from the curriculum. They also anticipate the structures and vocabulary that the students might need and they prepare visual images or cards. The activities are adapted and they are constantly searching for the resources that best fit their students’ needs.

They start with “an open question to develop the topic later on”. They always explain the objective of each activity before to start as “they need to clearly know what we are going to work and learn” and why. They also give them time to explore and manipulate by themselves using a group strategy.

The improvements would be in the preparation of the experimentation part as it takes a long time to get everything ready in. They would like to have a unique Science class where everything would be placed in the right order to start directly. Sometimes it is difficult to get their attention and reasoning in English is quite demanding.

Some of the difficulties that both teachers face are with the grouping. It is hard for the students to work in this way so they “stablished roles that can be helpful when it is time to work like this”. The level of English is another difficulty as some students really struggle with it. They stated that “we need to help those students so that they can be comfortable in the class”. Well-being of the students is essential for them.

The use of Catalan is accepted and they constantly use the rephrasing. Sometimes the translation into Catalan naturally comes but it is useful to comprehend. They stated that “you have to anticipate students’ questions that might arise so that it is easier to help them”. Autonomy is fostered and suitable resources are provided

The assessment is done taking the whole process into account. Many tasks are evaluated during that project and a final exam is also done. The final grade comes from the mixture of all of them. Self-assessment is also used.

*CLIL implementation through the observation*

The CLIL objective from their point of view was using English as a tool to communicate and construct the Science contents that were the main focus. They do so as the priority is focused on understanding, interiorizing and learning the ecosystem thing through the use of English.

Preparation in advance was seen with the materials they used and they managed the difficulties without any problems as they equally combined language, content and experimentation in groups nearly in all the activities. The students could talk in Catalan if needed and if some doubts about the English language emerged, they were solved.

The aim of each activity is presented and contextualized as they highlighted in the interview. They work in groups and they distribute the following roles: the secretary, the recorder, the group facilitator and the editor and materials manager.

The use of Catalan is accepted and they are encouraged to use English as much as possible without forcing them to do so. The activities are varied and they put into practice many group strategies that help the task to be meaningful. Through discussions and dialogues with the guidance of the teacher, the knowledge is built up. As they mentioned in the interview, it takes time to be ready for the lesson and pay attention.

**School 2 (teacher 3):** The experimentation part is essential but also easy to forget as other many aspects need to be taken into account when carrying CLIL out.

#### *Science vision through the interview*

This teacher had in mind that apart from experimentation, different kind of processes are involved and relevant for the learning process such as telling a story, showing images or being listening the explanation.

In order to decide which contents need to be worked, she uses the curriculum. She also looks for different materials to cope with the teaching according to the students' needs. She orders the activities from less to more difficulty and priority is given to hands-on activities. She first guides the students and then "the students talk and draw what they have found as well as the manipulation they have done". Relevance is given to the discussion that helps to build up the knowledge.

Grouping the students is used and she usually starts with a familiar question for the students according to the line that they are studying so they can feel comfortable enough. She stands out the fact of contextualizing the activities before carrying them out. This was one of the reasons why she discarded the activities that, from her point of view, were not contextualized in the topic chosen.

#### *Science vision through the observation*

The observations were done in the 6<sup>th</sup> grade and the topic in which they were working on was about cells, non-living things and living things. There was only one teacher.

This teacher works with Science not only focusing on the experimentation part but also using explanations, visual and digital aids and readings from the book. She starts the class revising the contents from the previous session by asking reproductive questions with a unique answer, she does an activity in the middle (that sometimes is reproductive) and they end up discussing and sharing the results. Participation is enhanced when the creation of open questions is promoted.

#### *English vision through the interview*

She speaks in English all the time as the students need to receive this input. She believes that “as they are getting this oral input, they improve in their writings. Reading is more complicated and you need to explain more things that they need to take into account”. She thinks that the oral input is the one that helps to develop the other skills. Teaching in English has helped her to identify which are the strengths and the weaknesses of the pupils and she uses the scaffolding when necessary.

She remarks the fact that “we don’t have to force them speaking in English; we need to respect their own rhythm and they go on when they feel prepared”. The rhythm of each child is respected as the process is not done in the same way for all the students. It is better to give time until they feel secure, comfortable and able to use it.

She has in mind that their students have English as a subject itself and when they are in Science, they put into practice what they have learnt so “these items are explicitly explained” and the students are conscious about the usefulness of the language.

#### *English vision through the observation*

She gives a lot of importance to the speaking while the other skills are also involved but in a less amount of time. According to the interview, she really speaks in English all the time since she goes to get them until they are back in class. As she does so, the students are encouraged to use the language in a natural way but they are not forced to do so. As she mentioned in the interview, the book is only used as a support for the readings.

#### *CLIL vision through the interview*

The use Catalan is allowed as “they need to feel comfortable”. She gives priority to the well-being of the pupils because if they feel forced, they are not going to produce output.

She understands CLIL as a balance between language and content. The main objective is the learning of science contents as it is the subject they are doing. English is used as the tool in which the knowledge is constructed.

The difficulty that she stands out the most is the explanation of certain concepts because sometimes it is so demanding for the students. She highlights that students “need to help each other translating what the teacher has said because she only speaks in English” so the interaction and help from the others helps to comprehend. From her point of view, the experimentation part is what she needs to improve “as you need to teach a lot of content and new vocabulary through a foreign language that sometimes you forget the experimentation part”.

The structure and organization of the sessions is needed. Having “clear ideas and spend lots of hours of preparation” would help a lot to decrease these difficulties. To cope with these difficulties, she uses “self-reflection and an accurate analysis of my own practice”.

When it comes to assessment, she uses the daily observation of the sessions such as “participation, attention and doing the tasks that are required” as well as an exam. She writes down 10 questions. From the 1<sup>st</sup> until the 5<sup>th</sup>, there are questions “that you think that each student should be able to answer”. From the 5<sup>th</sup> until the 10<sup>th</sup>, the difficulty increases to cope with the diversity.

#### *CLIL implementation through the observation*

She gives relevance to the experimentation part but in the sessions observed it was only done in the second session as in the first one the students were just sitting down listening to the explanation and participating when needed.

The questions she asked to the students when they were revising the lesson, such as “what is a cell? or which types of cells do you know?” were reproductive questions. The participation decreased as the answer required the explanation of a specific content. In the middle of the session, the type of questions changed and they became open. All the students were participating and they all wanted to collaborate.

The same situation happened when it was time to experiment as the parts of the microscope were learnt but then they were written down and translated in a paper sheet taking a lot of time from the session whereas when they were using the microscope, many scientific processes were put into practice as working in groups they could share ideas, make guesses, establish some facts and predict about the evidences they were seeing and so on. At the end of the class a long discussion took place.

Even though in the interview it seemed that reproductive tasks were not used, in the participant observation I could see that sometimes they are also included. This fact confuses because the rest of the tasks she proposes are following her principles.

Most of the activities were done in groups and she reflected about her teaching practice once the session finished.

**School 3 (teacher 4):** CLIL as an ideal chance to learn by doing through challenges.

#### *Science vision through the interview*

This teacher understands Science not only from the experimentation face but also from other ways of teaching. She highlights the atmosphere that she can see in each picture shown and the fact that when “you do, you always learn. Learning by doing is excellent”.

She first looks at the curriculum and then to their books to identify which are the best teaching materials to use in class. Experience also counts a lot with the help of the materials. “In Finland teachers let the students work either in groups, pairs or

individually so we are not lecturing the 45 minutes”. They teach the first 15-20 minutes and the remaining time focuses on personal work put in practice what they have learnt. Finnish pedagogy wants the “children to do things at school; they do not just listen all the time”.

The fact of having digital books has helped her to “re-think how I do and it is a challenge. I am still on the way of thinking about that” and this constantly reflection really determines the development of each lesson.

#### *Science vision through the observation*

The observations were done in the 5<sup>th</sup> grade and the topic in which they were working on was the solar system. There was only one teacher in the class.

This teacher understands science as a group of processes interrelated between them. Her session starts with an introduction on what is going to be taught and she starts explaining the new content. The students can participate when they want to. After 20 minutes, she proposes a wide range of activities to do that are relate with the topic and the students can choose the one they prefer. She goes around the class guiding and providing support when needed and she finishes the lesson with a discussion in which they all share their experiences. Many open questions to put in movement the students’ ideas are written down in the board during the whole class.

#### *English vision through the interview*

She sees a progression in the maturation of the students through the years. As they get older, their skills get better because the amount of exposure increases and time helps to deeply develop them. She affirmed that “they are so used to use the language that they do not really know when they are using it” so the language ends up being so familiar and natural.

The introduction of English as a foreign language was hard in the beginning because they had never been exposed to it but now English comes naturally. “When I said that some of them are not willing to produce spoken language is because when they heard it, they realize that they do not know the tense and they do not want to make mistakes”. For this reason, she formulates questions in another way so that they can feel confident and secure enough when answering.

### *English vision through the observation*

All the skills were equally worked in the session as they all need to be improved year by year. Different activities are proposed to accomplish with these objectives but English is not used all the time as they work in a multilingual way and Finnish is also used. Sometimes the students ask in Finnish and they are answered in English without any problems. Both languages become familiar and natural because they are often used.

The structures they use when talking are so complex and they produce a lot of oral output in English. The students are not forced to use English but it comes naturally as the speech is fluent and accurate.

### *CLIL implementation through the interview*

From her point of view, CLIL “is a chance. I think that somehow every child benefits from it”. She also remarks that children like challenges and the language can add something extra at any time.

Special care is given to the materials that will be the guide in the class. In Finland, there are plenty of quality materials that do not need to be built up from scratch but the difficulty lies on the choice.

The important thing from her point of view is to know the curriculum well and also having a good level of Finnish and English because these are the languages used when teaching CLIL. This discipline needs to be functional and visual to understand better what is being taught.

The main difficulty is the time. “It is very time consuming and it is hard work to choose the materials as they should be up-dated”. What is clear for her is that sometimes the students will come up with new ideas or interests that will require to be taught. This fact “gives you an excellent possibility to bring the world into the classroom”.

The assessment of the students is done through self-evaluations and co-evaluations as well as an exam.

### *CLIL implementation through the observation*

A lot of relevance is given to the discussion of ideas, guesses or predictions among the students because the dialogue always acts as the main tool to go on the Science learning.

The experience they have gained regarding the implementation of CLIL is easy to notice as they are so used to it and the development of the class goes very well. The students know the structure of the class and they seem to feel comfortable and secure. New strategies and ways of doing activities are search in every lesson planning. Moreover, she remarks a lot the fact of learning by doing instead of being listening all the time. Many other activities are involved in the Science teaching and are not focused on the experimentation part. The students are the protagonists of their knowledge and their voice is always taken into account.

## **5. Conclusions**

The main purpose of this research was to see the how teachers' perceptions around Science teaching as well as English teaching influence the CLIL practice in Primary Education. Through the interviews that had been done to four different teachers as well as the observations done in the corresponding schools to contrast the coherence between what they think and what they do lead to relevant findings.

Regarding the first research question that was about the teachers' perceptions regarding Science teaching, the results of the cases have been similar. They do not understand science only thinking about the experimentation part. Teaching Science involves many other processes that are integrated with the experimentation such as predicting, guessing, proving, finding evidences, discussing and sharing. Even though they all think quite the same, when it is time to put everything into practice it varies as one of them is only teaching for twenty minutes and the rest of the time is for the students to do hands-on activities, two of them propose different group tasks along the session and another one is teaching contents all the time.

When it comes to the activities planning, every teacher carries out the activities in a different way: one of them uses the level of difficulty as a reference, two of them follow their own learning cycle structure and another one focuses on the students' needs to decide the activities that will be done.

Although they all keep in mind the importance of asking open questions so as to foster the interaction among others that will be the engine to construct the knowledge, while the sessions were carried on, one of the teachers used many reproductive questions that decreased the level of participation of the students because the ones that did not know the answer could not participate. It is also relevant to highlight that they do not agree on the ideal moment to make these questions. At first they said that in the beginning it was fine but nearly all of them constantly ask questions during their sessions.

Regarding the second research question that was focused on teachers' perceptions focusing on the English teaching, the results from the teachers chosen reveal that they all try to involve writing, listening, speaking and reading in their classes even though some of them place the importance in only two because they think a process of maturation is needed to be totally developed as it is quite demanding. What all of them think and also do in their teaching practice is that they apply the scaffolding when any kind of support is needed. They keep in mind the well-being of the students in the class as well as their security and confidence. In addition, students are encouraged to produce output in English but they do not force them in any of the cases. As in all of the three schools the students have the target language as a subject, their improvement goes on when they see what they learn applied in the Science class. Even though in all the cases the worry for some students that struggle with this language is mentioned, they all try to find the best strategies so that everyone can understand. It is hard but it is also a challenge from which they can take profit of.

Regarding the third and the fourth research questions that focused on the teachers' perceptions around CLIL and its implementation in class, interesting results have emerged from the cases analyzed. Although the bases of CLIL are concise and specific, only one of the teachers integrates content and language at the same time without giving priority to one of the two elements. However, another teacher gives priority to the Science contents as it is the subject implicate and the other one understands the approach as a chance to constantly propose challenges to the students.

What they all put into practice is the strategy of grouping the students during the lesson. It seems to be an effective way of learning from which all the students can benefit from mainly because of the interaction and the help that is build up among them. They all coincide with the amount of time and preparation that is needed when they have to

choose, select, adapt and prepare the activities. When it comes to the language, they all allow the students to use Catalan or Finnish (in the case of Finland) in the CLIL lesson as the mixture of languages help to increase their confidence and the use of the language becomes more natural.

The difficulties that they face using this innovative approach are the same for the other subjects and each teacher focuses on a different thing. Some examples could be the improvement of the experimentation part, the improvement of working with the language, content and manipulation at the same time as well as the improvement of speaking less and let them do more.

It is important to highlight that what they think about evaluation is coherent with what they do in class. Some of these teachers use the self-reflection and co-evaluation but all of them evaluate not only the grade of the final exam but also the mixture of the other grades evaluated during the project.

In general, there is not a unique model of implementation that is useful for every context as every teacher adapts in taking into account the previous experience, the school context and the pupils needs. What these teachers said in the interview was quite coherent with what I could observe in class. Even though each of them has its own vision, they all could justify the choice of their decisions. It can be highlighted that the perception that a teacher has regarding teaching science as well as teaching English directly influences the practice of CLIL.

Teacher training courses regarding the formation of CLIL are necessary and essential for these specialist teachers that want to join the program. Many contexts and situations that are created using CLIL are not applied in any other subject so specific knowledge needs to be revised. It is a great challenge for both students and teachers to be involved in this approach as many things need to be rearranged and re-think but they can all benefit from it.

Having the chance to see the planning, the preparation and the implementation of this methodology in another country was relevant as it is always interesting to see how the things we do are applied in another place in a completely new context. It leads to a reflection about what we do and what needs to be changed or kept. It has also involved

professional and personal growth as their perceptions are different from ours and we can all learn from the others.

Carrying out this research has helped me to go deeper into the Science and English areas and it has contributed to expand the previous knowledge that I had regarding CLIL from the final dissertation last year. I would definitely affirm that it still has a long way to go and further investigation can be done regarding the topic of this research. What it is clear is that it is a great chance for the teachers who want to join it as the implementation and discovering of new approaches is what helps the society to develop.

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## 7. Annexes

The following table is the one that was used to analyze the results linking each question from the interview with a research question.

|  | Research question 1:<br><br>What are the teachers' perceptions regarding the Science teaching? | Research question 2:<br><br>What are the teachers' perceptions regarding the English teaching? | Research question 3:<br><br>What are the teachers' perceptions regarding CLIL? |
|--|--|--|--|
| In which of the following images do you think that the students are doing science? Justify your choice.  |  |  |  |
| In which of the following skills do you give more importance to: speaking, listening, writing or reading?  |  |  |  |
| Which is the most important objective that you consider in a CLIL class?   |  |  |  |
| When it is time to plan, how do you decide which are the English contents to work as well as the Science contents?   |  |  |  |
| Let's imagine that you need to work on the friction force topic. I will show you 8 cards. Each of them contains one different activity around the topic and I ask you to choose 5 of these 8 cards and you leave 3 of them out.<br><br>Why do you decide to leave out these ones and keep the other ones?<br><br>How would you order the ones that you choose? Why do you decide this order? |  |  |  |
| If you needed to carry out one of these activities that you kept, which one would you choose? How would you plan it?<br><br>With which type of question would you begin the activity?  |  |  |  |
| Tell me the difficulties that you need to cope with when you use CLIL while doing sciences in English.   |  |  |  |
| What will you improve or change regarding your Science and English teaching?   |  |  |  |

|   |  |  |  |
|---|--|--|--|
| All the difficulties that you come across while doing CLIL are the same that you face when you teach other subjects?  |  |  |  |
| How do you try to solve these difficulties?   |  |  |  |
| If a child answers in Catalan all the time, how do you manage the situation?  |  |  |  |
| What if they ask you the translation of some words into English?  |  |  |  |
| Imagine that you write on the board and one child asks you for a verbal tense that you have written and why did you write this way. How do you manage this situation? |  |  |  |
| Do you let them write in Catalan or only in English?  |  |  |  |
| How about the assessment? How do you plan it and how do you do it?  |  |  |  |

Figure 3: table in which the questions from the interview are classified and liked according to the research questions.

The following images were the ones that the teachers needed to discuss in one question from the interview. They were asked to say in which ones they think that the students are doing Science and why they think so.



Figure 4: students listening to the explanation of the teacher



Figure 5: students working in the forest



Figure 6: students working in the laboratory



Figure 7: students building up a mock-up.

Here you have the cards with the activities that were used in one question from the interview in which teachers were supposed to select, discard and justify their decisions.

A paper sheet in which three situations are represented is given to the students: there is a ball on the grass, a ball on the sand and a ball on the ice. The students are asked to choose the option in which they think that the ball will go further if they kick it on these surfaces. The justification of their choice is also asked and the students can go to the playground to try it.

The teacher asks the students what is the friction force and they need to draw how they imagine it. All the opinions are shared in the board.

A wide variety of materials that will be used during the session are placed in one table from the class. The students are divided into groups and each of them can go to this table to experiment and discover the materials. The manipulation is supported with a grid in which the students are asked to write down the name of these materials as well as their characteristics.

The students are divided in little groups and some slopes and stripes with different textures are given to them (each group will have the same materials). They are allowed to experiment with these materials and they will have to fill in a grid in which they need to write down the position that they think the strips will get once they are thrown through the slope.

A wide range of stripes with different textures as well as magnifying glasses are provided to the students. They are encouraged to observe and draw each texture with the magnifying glass so that they can relate that the texture of the materials influence the friction force.

A cardboard with sand, a cardboard with stones and a cardboard without any material is given to the students. They are asked to order these cardboards in the best way so that when throwing a ping-pong ball, it reaches the furthest possible distance. Each group orders it in the way they think it will work and then they all try it.

The students have a recipient full of water with a cork boat on it. A hairdryer is placed in each side of the recipient and different powers are tried. First of all, one of the hairdryers is placed in the 1st power whereas the other one is placed in the second or in another one. The students need to observe what happens. Their opinion is asked and they need to justify what will happen if both hairdryers are used in the same or different powers before turning them on.

The students are asked to design a mind map so that the concepts that have been worked are organized. The students will have to contribute giving their proposals and each group will explain to the others how they have organized it and why. In this way, a huge mind map will be created using the contributions of each group. Self-avaluation will be done with a grid in which they will also evaluate their classmates.