From low to high order thinking skills in CLIL Science Primary textbooks: a challenge for teachers and publishers

PRESENTED BY: Mercedes Santo-Tomás González
TUTOR: Dr. Emma Dafouz Milne
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Durante la última década dentro del espacio europeo ha surgido un nuevo enfoque educativo en el contexto escolar: el Aprendizaje Integrado de Contenidos y Lengua Extranjera (AICLE/AICOLE). Las políticas europeas que promueven el multilingüismo, la movilidad, internacionalización, globalización, multiculturalidad y el progreso económico y tecnológico, han visto en este enfoque pedagógico un elemento clave para la consecución de dichos objetivos y la construcción de Europa. (Pérez-Vidal, 2009; Coyle, 2010). Lo característico de este enfoque es que el aprendizaje de una o varias lenguas, integrado con el aprendizaje de contenidos curriculares, se dirige no sólo a las élites sino al sector educativo en general, incluyendo las clases más desfavorecidas (Coyle, 2010). Las implicaciones de este nuevo enfoque pedagógico abarcan tanto, dimensiones sociales, educativas, lingüísticas y cognitivas (Pérez-Vidal, 2009).

La repercusión en Europa de AICLE, como nuevo enfoque pedagógico, ha suscitado el interés de investigadores y académicos en los últimos años (Coyle, 2000; Dalton-Puffer, 2008; Ruiz de Zarobe, 2009; Dafouz y Guerrini, 2009). Uno de los aspectos a investigar está basado en el argumento de que el pensamiento dirige el proceso de enseñanza-aprendizaje y por tanto la buena práctica en AICLE ha de estar dirigida por la cognición (Marsh et al, 2008). En esta línea, investigadores como Dalton-Puffer (2004, 2007) y Clegg (2007), entre otros, afirman que el enfoque AICLE puede mejorar su nivel de excelencia mediante la enseñanza explícita de lenguaje asociado a la enseñanza explícita de funciones académicas y cognitivas. La investigación en este campo ha estado fundamentalmente dirigida hacia contextos de interacción oral. No obstante, la investigación sobre materiales escritos y específicamente libros de texto es muy escasa o prácticamente inexistente.

El propósito del presente estudio es analizar la enseñanza de las destrezas de pensamiento (cognitivas) a través de libros de texto de Primaria, en el área de Ciencias, en el contexto del programa AICOLE, que se está llevando a cabo en la Comunidad Autónoma de Madrid. Un factor determinante para la puesta en marcha de este estudio, es la arraigada tradición del uso de libros de texto como material básico en gran parte de...
las escuelas españolas, que se ha extendido también al programa AICOLE. Una revisión y adaptación de los libros de texto parece la consecuencia necesaria para conseguir una enseñanza de calidad.

El punto de partida de este estudio es que los libros de texto de ciencias en las clases AICOLE, pueden ser un buen medio para enseñar explícitamente, destrezas de pensamiento y de lenguaje académico, sin restringir el nivel de complejidad de dichas destrezas al orden más bajo (memorización), sino por el contrario, fomentando capacidades cognitivas de orden superior (comprensión, deducción, análisis, pensamiento creativo y crítico) desde los primeros años del proceso de enseñanza-aprendizaje.

Como instrumento de análisis se usó la Taxonomía Revisada de Bloom (TRB) por Anderson y Krathwohl (2001) y los exponentes del lenguaje (Clegg, 2007) usados como indicadores de enseñanza explícita. Se analizaron cuatro unidades sobre el mismo tema, a saber, Plantas, en cuatro libros de texto de editoriales diferentes, publicados entre el 2005 y el 2010 y actualmente en uso. La información del contenido ofrecido por el texto y las actividades que los alumnos tenían que realizar en el propio libro se categorizaron de acuerdo con la Tabla Taxonómica de la TRB, que contiene dos dimensiones: la dimensión de los cuatro tipos de conocimiento: factual, conceptual, procedimental y meta-cognitivo y la dimensión de los seis procesos cognitivos: recordar, entender, aplicar, analizar, evaluar y crear.

Se valoró el grado de explicitud de acuerdo con los indicadores del lenguaje usado y se valoró también el nivel de complejidad de las destrezas de pensamiento, desde bajo hasta alto orden. Asimismo, se valoró la consistencia (alineación) entre la información aportada por el texto y las actividades requeridas a los alumnos.

Los resultados fueron que las destrezas cognitivas activadas pertenecían en su mayoría a las categorías cognitivas más bajas, predominando el nivel de destrezas de pensamiento de bajo orden. Las destrezas cognitivas y las funciones académicas, en general estaban presentadas explícitamente. Curiosamente, funciones académicas tan importantes como “definir”, “clasificar” y especialmente “explicar” aparecieron con frecuencia
implícitamente presentadas, con exponentes lingúísticos del tipo: “completa”, “nombra” o “escribe”. Sin embargo, el texto de publicación más reciente (2010) contiene un considerable número de actividades correspondientes a niveles de pensamiento de alto orden y asimismo activa una mayor cantidad de categorías y de subcategorías cognitivas de orden superior.

El estudio sugiere formas de activar destrezas cognitivas de alto orden, por medio del uso de preguntas que induzcan a los alumnos a buscar y a dar razones, a inferir consecuencias, a buscar procedimientos facilitadores de la realización de actividades y a ser conscientes de su propio aprendizaje. También sugiere la necesidad de incidir en actividades propias del conocimiento conceptual y a implementar actividades que potencien el conocimiento procedimental y meta-cognitivo, concluyendo que es necesario poner altas expectativas en los alumnos, teniendo en cuenta la necesidad de guiarlos y apoyarles en aquello que no pueden hacer por sí mismos (Vygotsky, 1978, Bruner 1985), fomentando el aprendizaje colaborativo y dotando tanto a los alumnos más desfavorecidos como a los privilegiados de las destrezas cognitivas que les van a permitir desenvolverse tanto en su vida profesional como personal.

Finalmente el presente estudio sugiere la conveniencia de que las editoriales tengan en cuenta el marco teórico-práctico de la Taxonomía Revisada de Bloom, ya que podría contribuir en gran medida a mejorar la calidad de los textos. Consecuentemente, se sugiere la misma implicación por parte del profesorado para poder sacar el máximo rendimiento a textos elaborados bajo estas premisas.
ABSTRACT

The present study analyzes CLIL Primary Science textbooks, in the context of the CLIL program that is being carried out in the Autonomous Community of Madrid. The point of departure is that science textbooks in Primary CLIL classrooms can be a good means to explicitly teach thinking and academic language skills to young learners, and specifically that the teaching of low order thinking skills (LOTS) may be expanded to the teaching of high order thinking skills (HOTS) from the first years of the teaching learning process, since the development of the latter “enable students to be independent learners (...) and might help to overcome socio-economic and cultural differences” (Chipman, Glaser & Segal, 1985: 5). The Unit of Plants was analyzed in depth in four textbooks of grade 2 Primary. The instruments of analysis were Bloom’s Revised Taxonomy (BRT), and the language exponents used as indicators of implicitness or explicitness. The results show that the thinking skills most activated correspond to the lower cognitive categories in BRT, and that the majority of functions are explicit. However, some of the most important academic functions are implicitly presented. Provided that the most recent published textbook goes beyond the lower cognitive categories to the upper one and has more instances of high order thinking skills, it could be expected an improvement in these issues. The study suggests some possible ways of implementing HOTS; the need of explicitly teaching some academic functions; and the convenience of incorporating BRT framework in textbooks to “help teachers analyze their objectives, instruction, and assessments and determine the alignment of the three” (Anderson & Krathwohl 2001: xxiii).

Key words: CLIL, LOTS, HOTS, academic functions, cognitive categories, language exponents, explicit teaching.
1. INTRODUCTION

Content Language Integrated Learning (CLIL) has widely spread in Europe since the 1990s, largely due to the language policies of the European Union (Nikula, 2005). European institutions, concerned with the construction of Europe and especially with the preservation and promotion of language diversity, heralded change in the educational approach in general and languages in particular. Thus, CLIL as a specific European approach began to take shape (Pérez-Vidal, 2009: 4).

The integration of subject-content and language for the acquisition of a second, or a third language, not only represents a form of language learning, but an educational approach which is content-driven. “CLIL is not simply education in an additional language; it is education through an additional language based on connected pedagogies and using contextual methodologies” (Coyle, 2010: 12). The implications of this approach are multifaceted, encompassing social, cross-cultural and international dimensions, specifically as regards European Union (EU) integration, as well as educational, linguistic, and cognitive dimensions.

CLIL as a new educational approach, has aroused the interest of scholars and researchers over the past few years (Coyle, 2000; Dalton-Puffer, 2008; Ruiz de Zarobe; 2009). It is argued that a CLIL approach can be improved by explicit language teaching linked to explicit teaching of thinking and academic language skills (Dalton-Puffer, 2004, 2007; Clegg 2007). The terms ‘thinking skills’ encompasses a huge variety of strategies and skills and responds as well to many different definitions and different names for the same thing (see Baron and Sternberg, 1987 and Dalton-Puffer, 2007). However, for the purpose of the present study, ‘thinking skills’ will be equated to the cognitive processes necessary for the learning process to take place (e.g. identifying, recalling, defining, classifying, analyzing, hypothesizing). As regards academic language functions, it could be stated that “there exists a strong affinity between these thinking skills and academic language functions” (Dalton-Puffer, 2007: 128). In fact, the abovementioned examples of thinking skills coincide with examples of academic language skills or functions, which are the functions proper of academic environments, and present specific language in each discipline. Both, thinking skills and academic
language functions are linked to linguistic manifestations, sentence patterns, discourse markers or what Clegg (2007) terms as ‘language exponents’.

Previous studies concerning this approach are mainly focused on classroom spoken interaction (Dalton-Puffer, 2004, 2006) but, in general terms, less attention has been paid to the study of classroom materials and more specifically, textbooks in a search to help CLIL teachers in the implementation of those thinking skills and cognitive academic language that learners require in school settings.

1.1 Rationale for the current study

A determining issue that underlies the onset of the present study is the strong tradition in Spanish Primary schools of relying on the use of textbooks. In recent years, there has been a call for meaningful learning (which Spanish translation, ‘aprendizaje significativo’ might be in need of revision for better understanding of the term amongst the whole school community members). Along with this call, the Spanish educational authorities have as well implemented the eight key Basic Competences for life-long learning within a European reference framework for EU countries.¹ These key competences are all interdependent, and the emphasis in each case is on critical thinking, creativity, initiative, problem solving, risk assessment, decision taking and constructive management of feelings. However, these competences represent global aims that are in need of more specificity. Thinking skills are the response to provide the basic competences with a more specific and concrete way of achieving the educational objectives. The study will deal with lower and higher order thinking skills from the perspective of the Bloom’s Revised Taxonomy. So far, there has been a research study on cognitive engagement by means of science lessons observed, videotaped, transcribed and analyzed for instructional opportunities that teachers offered to engage pupils in the different levels of cognitive processes and knowledge dimensions of

Bloom’s Revised Taxonomy\(^2\), but little if none research addressed to the analysis of textbooks.

### 1.2 Aims and research questions

The point of departure of the present study is that science textbooks in Primary CLIL classrooms can be a good means to explicitly teach thinking and academic language skills to young learners; and specifically that the teaching of thinking skills need not be restricted to the low order thinking skills. On the contrary it may be expanded to the teaching of high order thinking skills from the first years of the teaching learning process. “An added advantage of explicitly working on learning strategies is that student’s learning will be transferred to other areas of their schooling” (Halbach, 2009).

In addition to addressing the topic of teaching thinking skills to young learners, this study is centered in highlighting the need and the relevance of addressing this kind of cognitive stimulation to underprivileged learners, which according to most of the literature read (Bruner, 1973; Chipman et al. 1985, Anderson and Krathwohl, 2001, Cummins 2001, Coyle 2010) can greatly benefit from this educational approach.

The aim of this study is therefore to respond to the following research questions:

1. What types of thinking and academic skills do the textbooks analyzed in this study activate?
2. How are these thinking and academic skills articulated through specific activities and tasks? Are these thinking and academic skills explicitly or implicitly presented and, thus, taught by the teacher? What ‘language exponents’\(^3\) are used to make these thinking skills explicit and to what extent?
3. What level of thinking skills predominates in the textbooks analyzed, higher order thinking skills or lower order thinking skills?

This research may contribute to support teachers in CLIL in their demand for good materials and good textbooks that may help to improve the teaching-learning process in these environments.

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\(^3\) Language exponents are the different language formulations that represent functional language (e.g., suggesting, apologizing in interpersonal communicative situations) or represent functional language in academic settings (e.g., defining, describing, classifying and the like cognitive processes involved).
1.3 Structure of the present study

The present study is organized in five different chapters. Following this introduction, chapter two describes the Content and Language Integrated Learning approach, as it is the frame in which the thinking skills will be under study; the learning theories underlying the CLIL approach; and the taxonomy selected to deal with the abovementioned thinking skills. Next, chapter three contextualizes the current study and describes the data collection, the methodology and the instruments of analysis. Data analysis is included in the same chapter, divided in four sections corresponding to each of the four textbooks analyzed. Subsequently, chapter four presents the discussion of the findings. Finally, chapter five includes the conclusions and pedagogical implications of this study.
2. LITERATURE REVIEW

The present study deals with the analysis of the teaching of thinking skills from lower to higher order, in CLIL primary Science textbooks, in the context of the CLIL program that is being carried out in the Autonomous Community of Madrid.

In the Knowledge Age, the teaching of thinking skills is considered to be a priority, in order to well-equip learners to cope with the demands of a changing world. Therefore, the proceeding chapter will explore theories and approaches supporting this point of view. For that aim, the chapter has been divided into four sub-headings.

The first sub-heading sets out to describe the Content and Language Integrated Learning approach, as it is the frame in which the thinking skills will be under study, along with a brief mention of some Foreign Language learning theories. The second sub-heading deals with the Learning Theories underlying the CLIL approach. The third sub-heading presents the current relevance given to the issue of thinking skills taught independently or as part of the curricula. The last one will describe in more detail the taxonomy selected in this study to deal with the abovementioned thinking skills, (Bloom’s Revised Taxonomy, 2001) providing as well a brief comparison with the original Handbook (1956)

2.1. Content and Language Integrated Learning (CLIL)

Content and Language Integrated Learning (CLIL) is a dual-focused educational approach where subjects are taught through the medium of a non-native language, being the focus both on content and language, though at a given time the emphasis may be greater on one or the other. Thus, CLIL is an innovative fusion of language and subject education (Coye, 2010; Bentley, 2010). According to Eurydice (2006: 7) ‘this twofold aim (...) 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’.
2.1.1 European initiatives

During the past decades this approach has largely spread through Europe, in an attempt to construct a common European language framework. The main language acquisition theories and language programmes that have preceded the CLIL approach are the Input Hypothesis by Krashen (1985), the Output Hypothesis by Swain and Lapkin (1995), the Canadian immersion programme (Genesee 1994, Lyster 2007) and the U.S. content-based instruction (CBI) in the 1990s (Crandall 1993, Grabe and Stoller 1997, Met 1991, 1999). CLIL has benefited from the Canadian and the U.S. immersion experiences, but its rationale and its background, shape CLIL as a distinct European construct. As Pérez-Vidal (2009: 3) puts it, “what makes this approach different from previous experiences is its multifaceted nature which encompasses a socio-cultural, an educational, a linguistic and a cognitive level.”

What is significant in our current context in Europe is that language learning, integrated with content learning, “has now been opened up for a broad range of learners, not only those from privileged or otherwise elite backgrounds.” (Coyle, 2010: 2). The current European policies intend to promote multilingualism, multiculturalism, mobility, internationalization, globalization, economic and social convergence and technological progress. “The impact of globalization (...) especially in Europe (...) highlighted the need for better language and communication educational outcomes” (Coyle, 2010: 4). This explains why CLIL is so successful and why it has extended so rapidly. Though the driving forces for language learning may differ according to each country or region, their common objective is the need to adapt content-teaching methodologies to raise levels of proficiency in conjunction with the development of the mother tongue skills.

“The promotion of linguistic diversity in education and training has always been an important consideration in planning the successful construction of Europe” (see Eurydice 2006: 8); yet, it was not until the 90s that European institutions reflected this concern in the Lingua Programme. One of the first pieces of legislation was the 1995 Resolution of the Council. In the same year the European Commission in its White Paper entitled Teaching and Learning: Towards the Learning Society, proposed the formula 2+1: that is, all European citizen should be able to use their native language
plus two other. “Since then, multilingualism has been at the heart of European policies”, (Pérez-Vidal, 2009: 4).

In 2001, the European Year of Languages was held, followed in 2002 by the Barcelona European Council which called for a sustained effort on the part of the Member States. In 2003 the European Commission launched its *Action Plan* 2004-2006. At present CLIL type provision is under an ongoing development within the current generation of education and training programmes (2007-2013).

Additionally, the Council of Europe designed two instruments for the promotion of the highest levels of language education: the Common European Framework of Reference for Languages and the European Language Portfolio (Council of Europe 2001). Under the auspices of the Council of Europe and Commission-funded projects, the CLIL concept began to develop in different European countries.

### 2.1.2 CLIL: Educational gains

According to Mehisto, Marsh and Frigols (2008) in an integrated world, integrated learning is considered as a modern form of education that provides knowledge and skills appropriate for the global age. In line with this, the mindset of Generation Y (1982-2001) and the Cyber Generation (born after 2001) are focused on immediacy as in ‘learn as you use, use as you learn’. CLIL is an innovative approach that will meet the needs of this new age. However, although this immediacy of purpose has to be attended, there is also a need to find ways of promoting motivation for learning whether there is immediacy of purpose or not. As Wiesemes (2009: 47-49) states:

CLIL raises learner motivation, because the learners are challenged in a way that allows all learners to follow a different and difficult curriculum. (...) CLIL contributes to raising learner achievement, especially for less able pupils. Effective CLIL practice allows for the (...) development of thinking skills (...) another crucial condition for implementing and developing CLIL are teacher’s beliefs.

In the same line Coyle (2010: 6) states that “(m)uch CLIL classroom practice involves the learners being active participants in developing their potential for acquiring knowledge and skills (education) through a process of inquiry (research) and by using
complex cognitive processes and means for problem solving (innovation).” Mehisto, Marsh and Frigols (2008: 30) claim that “(t)hinking drives the teaching/learning process. The more powerful the thinking, the greater the learning. CLIL is no exception: good CLIL practice is driven by cognition”.

2.1.3 CLIL: As the integration of Language, Content, Cognition and Culture

Coyle (2010) provides three interrelated perspectives of language learning and language using within a CLIL linguistic progression, namely, language of learning, language for learning and language through learning:

- **Language of learning** is the language needed for learners to access basic concepts and skills related to the content of the subject, like the language of science.
- **Language for learning** is the language needed by learners to operate in a foreign language environment in order to be able to carry out the planned activities effectively.
- **Language through learning** links language to thinking. “When learners (...) articulate their understanding, a deeper level of learning takes place. (...) In CLIL settings, new meanings require new language. (...) learners need language to support and advance their thinking processes whilst acquiring new knowledge, as well as to progress their language learning” (Coyle 2010: 37-38).

Hitherto, content, language and cognition have been linked to the CLIL approach. There is another dimension left, that of culture. The four dimensions integrated in the CLIL approach, within a basis of socio-constructivist ideas, known as the four Cs curriculum lead us to explore this conceptual framework developed by Coyle, that is shown below in Figure 1.
The 4Cs Framework integrates four contextualized blocks: Content (subject matter), Communication (language learning and using), Cognition (learning and thinking processes) and Culture (intercultural understanding and global citizenship).

They involve, respectively, progression in knowledge of the content; interaction in the communicative context and development of language in authentic and scaffolded situations (see p. 21); engagement in cognitive processes from lower to higher order thinking and the acquisition of an intercultural awareness by positioning of self and ‘otherness’.

Learning to use language while using language to learn builds on the following principles:

1. Content matter is not only about acquiring knowledge, it is about creating knowledge.
2. Content is related to learning and thinking (cognition).
3. Thinking processes (cognition) need to be analyzed for their linguistic demands.
4. Language needs to be related to the context, to cognitive processes and to the construction of content.
5. Interaction is fundamental in the learning context.
6. Intercultural awareness is fundamental to CLIL.
7. CLIL is embedded in a wider educational context.
In the CLIL classroom the language level and the cognitive level of the learners are not likely to match. In Figure 2, below it can be seen an adaptation of the ‘language proficiency’ and academic performance Cummins’ (1986) framework.  

![CLIL Matrix diagram](image)

**Figure 2:** The CLIL Matrix (adapted from Cummins 1986)

As can be seen in Figure 2, quadrant 1 corresponds to a context of low cognitive demands and high language support. This zone is defined as a *Zone of Comfort* for the learners. As we move to quadrant 2, where the language support and the cognitive demands are equally high, the learners enter a *Learning Zone*. If we are able to lead the learners towards quadrant 3, where there is low language support and high cognitive demands, learners will enter a zone that the author of the present study has renamed as *Zone of Achievement*. The original name was *Zone of Frustration*, to warn teachers of avoiding entering this zone without careful planning, elaborating and scaffolding strategies, bearing in mind that this zone represents the highest proficiency in terms of content, language and cognition. Quadrant 4 is the *Zone of Boredom*, as it presents low

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4 Presented by Bentley (2010) during a CLIL training course that the author of this study attended in the Norwich Institute of Language Education (NILE).
language support and low cognitive challenge. The names given to the 4 zones in Bentley's adaptation provide the teacher with a deeper insight of what may be happening to the students learning process in each quadrant. For instance, in quadrant 1, where they have low cognitive demands and high language support, the students are in a situation of comfort, from which they have to evolve to a learning situation in quadrant 2 by means of high language support and high cognitive demands, until they get to quadrant 3, the achievement zone. It seems clear the need to avoid entering the boredom zone.

2.1.4 Cummins’ BICS and CALP in the CLIL framework

The original framework in Cummins and Swain (1986: 152) ‘tries to integrate an earlier distinction between basic interpersonal communicative skills (BICS) and cognitive/academic language proficiency (CALP) (Cummins 1980a) into a more general theoretical model.’ In Cummins framework the terms ‘context-embedded’ and ‘context-reduced’ in the x axis (corresponding to the terms high and low language support), represent the BICS and the terms ‘cognitively demanding’ and ‘cognitively undemanding’ in the y axis represent the CALP. As these authors put it the BICS-CALP distinction was intended to show that academic deficits are often created by teachers who do not realize that it takes longer to attain academic skills than to attain communicative skills. Accordingly, Dalton-Puffer (2004) points out, that students may need special training in CALP, even if they are fluent in their L2.

Cummins’ distinction between BICS (everyday context-embedded conversational language) and CALP (context-reduced academic language of the classroom) affects all languages. From this perspective, Cummins (2001) states that BICS in L1 can reach higher development than CALP, and that the former is achieved by all speakers regardless their intelligence quantifier (IQ) or their academic aptitude, whilst the latter depends on academic instruction and meta-linguistic awareness, though it is as well dependant on BICS development. Individual differences in CALP are strongly related to academic progress whereas individual differences in BICS are not. The relationships between CALP, overall language proficiency, cognitive skills, and academic progress can be seen in Figure 3 below.
In immersion programs, the achievement of native-like proficiency in BICS may take up to two years, whilst CALP achievement may take between five or seven years. CALP represents not only the learning content subject vocabulary, but the acquisition of thinking skills and the abovementioned meta-linguistic awareness. Cummins’ Interdependence Hypothesis (2001) states that CALP in L1 will transfer to CALP in L2, since L1 and L2 CALP are manifestations of a common underlying proficiency (CUP) across languages. This is represented in Figure 4 below.

**Figure 3:** Relationship of CALP to overall language proficiency, cognitive and memory skills and educational progress (Cummins, 2001)

**Figure 4:** The Common Underlying Proficiency (CUP) model of bilingualism
‘The Interdependence Hypothesis (see Figure 5 below), would predict that older L2 learners whose L1 CALP is better developed, will acquire cognitive/academic L2 skills rapidly than younger learners’ (Cummins, 2001:120).

![Figure 5](image)

**Figure 5**: The ‘dual-iceberg’ representation of bilingual proficiency: the Interdependence Hypothesis (Cummins, 2001)

The strong implications of this prediction as regards CLIL programs are of great relevance, especially when as Chipman, Segal and Glaser (1985: 5) maintain, “(...) there is evidence that explicit instruction in these skills is rare and that students’ mastery of them is frequently inadequate”. In the same line, Clegg (2007) points out that, even in L1, it is not common for subject teachers to teach explicitly thinking and academic language skills and their correspondent language exponents.

Language exponents are the different language formulations for performing a language function and represent functional language within the BICS (e.g. suggesting, apologizing, inviting and the like) or within the CALP (e.g. defining, classifying, hypothesizing and the like cognitive processes). This issue will be developed fully in the next chapter.

Although it would seem as obvious, no mention has been done so far to the fact that CLIL is founded on the communicative approaches that characterized the 1980s. In fact, as Perez-Vidal (2009: 6) puts it “CLIL is essentially the natural development of the communicative approaches.” Linking with what hitherto has been exposed about the CLIL approach, the next sub-heading proceeds to explore some of the CLIL underlying learning theories, namely, cognitivism, constructivism, and socio-constructivism.
2.2 Learning theories underlying the CLIL approach

Underlying the CLIL approach are the Cognitivism, Constructivism and Socio-constructivism theories. Behaviorism which preceded Cognitivism, focused on the objectively observable aspects of learning, the observable stimuli and responses, considering the mind aspects as pertaining to behavior (Skinner, 1971). Cognitive theories go beyond behavior to explain mind-based learning. Constructivism views learning as a cognitive process in which learners actively construct their knowledge.

Cognitivism emerges in the 1950s as a response to behaviourism which had failed in explaining how the mind works. Ausubel (1968) is considered to be the first in constructing a systematic model of cognitive learning. Bruner has as well been considered as a cognitivist, but here we have to mention that we can find many authors evolving from one theory to the other along their lives. So is the case of Bruner, who is also considered to have had an impact in constructivism and who also has an interest in the social factor.

Constructivism is a theory of knowledge based on the principle that humans generate knowledge and meaning from an interaction between their experiences and their ideas. Piaget, one of the pioneers amongst the constructivist theoreticians and researchers, called these systems of knowledge, schemata.

2.2.1 Vygotsky: A socio-constructivist view of learning

Although most constructivists, have taken into account the importance of the social world for human development, it was Vygotsky (1978) who laid down the basis of social-constructivism. Vygotsky was a Russian psychologist in the Marxist Soviet Union who shared Marx and Engels view of humans as social beings, “belonging to a greater whole” as Marx (1973: 83) quoted by Richardson (1998), put it. It was in this “greater hole”, in external processes of social life, that Vygotsky was to look for understanding of human cognition and development. As Richardson (ibid.: 156-159) points out:
(…) humans evolved to adapt to the world by means of social cooperation, through and with other people in a definite cultural form (…) involving social and cultural tools. Through these cultural tools, the child is acquiring patterns (often highly abstract ones) of social interaction (…) There are several aspects of the internalization of external social patterns. Development is from the “outside in”. “The very mechanism underlying higher mental functions is a copy from social interaction; all higher mental functions are internalized social relationships.” Another aspect is the remarkable creativity resulting from this dialectical process. (…) In each of these aspects Vygotsky argued that speech has a crucial role to play.

Vygotsky (1993: 108-109), cited in Richardson (1998: 159-160) claims that once children learn to speak, their behavior, especially that related to tool use, becomes entirely different. Far from language being an extension of cognition, the blending of thought and speech “results in symbolic activities beginning to play a specific organizing part, penetrating into the process of tool use and giving birth to principally new forms of behavior”, concluding that speech is somehow integral to cognitive functioning.

As Richardson (ibid. 160) states, speech helps the child to master an object through mastery of his own behavior. ’At first, the child’s response to a task is a mix of the practical and the social: direct attempts to solve the problem; emotional speech; appeals to the experimenter; and so on’. Vygotsky (1966: 43), cited in Richardson (ibid.), states that through speech, the same action acquires a completely different, communicative function “from a movement directed towards the object, it becomes a movement directed towards another person, a means of communication: the grasping is transformed into pointing”. This way, pre-linguistic communication is not a consequence of cognitive development, as argued by Piaget, but emerges from the acquisition of cultural tools through adult’s contingent behavior. Finally, Vygotsky (1962: 148-149), quoted in Richardson, distinguishes between external speech, used in social discourse; inner speech (“a distinct plan of verbal thought… fluttering between word and thought” and the level of verbal thought still more “inward”. This is the level of thought itself, which is not accompanied by a simultaneous unfolding of speech. “The two processes are not identical, and there is no rigid correspondence between the units of thought and speech…Thought has its own structure, and the transition from it to speech is no easy matter”, neither is mastering speech in the development of social interaction in young children. As Vygotsky (1962: 32) claims:
(…) from the motive which engenders a thought, to the shaping of the thought, first in inner speech, then in the meanings of words, and finally in words … [all involving], an infinite variety of movements to and fro, of ways still unknown to us.

Vygotsky’s theories specify a distinct role for the teacher or other expert in instruction and cognitive development. Therefore during the last decade there has been an emphasis in educational environments to institute Vigotskian principles in schools, emphasizing peer-group interactions and collaborative learning (Bruner, 1985a; Johnson and Johnson, 1986; Slavin, 1989; Rau and Heyl, 1990; Totten, Sills, Digby and Russ, 1991; Gokhale. 1995). The most popular idea has been that of the “zone of proximal development” (ZPD). Vygotsky defined it as that latent “gap” between what a child can do on his or her own and what can be done with the help of a more skillful other. Such “potential” cognition is a better index of a child’s development, he argued, than the apparent level, as revealed, say, by a test score. The idea has been pursued through studies of adult-child, or expert-novice interactions “in” what is thus assumed to be the child’s or novice’s ZPD,” (Richardson ibid: 163)

2.2.2 Piaget: A constructivist view of learning

Piaget was the founder of a new discipline called Genetic Epistemology whose goal is the investigation of the origins of knowledge and its development. Piaget’s theory of cognitive development has remained as the most detailed, as well as a preeminent example of a constructivist approach (see Chapman, 1988; Richardson, 1998)

For Piaget, human intelligence is the process of adaptation to life as a whole. But, adaptation at the mental level cannot be predetermined. The evidence is that, in the emergence of knowledge and reasoning “there is a continual construction of novelty” (Piaget 1970/1988:11), quoted in Richardson (1998). Richardson (ibid.) goes on stating that this creativity of thought is the strongest assumption in Piaget’s theory, along with the role of action in “revealing” the world to which organisms adapt. Intelligence arises from external actions on physical objects and, on or with other human agents. The basic constituents of intelligence are the coordinations and equilibrium of parts and wholes structures, that are revealed by such external actions and which become represented in
mental operations or structures (Piaget, 1975). For Piaget, thought proceeds from the whole to the part, which gives a hint for educators.

According to Chapman (ibid,) through a verbal based research, Piaget found that young children thinking, tended either to be grouped in global schemes (syncretism, in which the whole predominates over the parts) or to be fixated on individual details (juxtaposition, in which the parts predominate over the whole. The two tendencies were reported respectively in The language and thought of the child (1923) and in Judgment and reasoning in the child (1924). This apparent contradiction was viewed by Piaget as tendencies representing an inability to relate parts and wholes at the level of representational thought; what was missing was the means or moving back and forth between them and both corresponding to unstable forms of equilibrium. Richardson (ibid: 105) points out that, ‘(t)he process of development consists of progressive enrichment of equilibrations.’

Different degrees of equilibrium characterize three stages of development, namely sensorio-motor intelligence; pre-operational intelligence and concrete operations; and propositional (formal) operations. In these stages, age has only been a descriptive marker but not an actual criterion itself. As Chapman (ibid: 33) puts it, ‘Piaget’s stages were meant as a classification of forms of thinking, not of individual children’. Many researchers have reported mental abilities ‘in advance of the ages when Piaget said they would emerge. (…) Much of the doubt has been about whether children who got the “right” answer actually understand its logical necessity, the latter being the true criterion of development in Piaget’s terms’ (ibid: 129).

Within the social aspect, Richardson (ibid.) argues that contrary to many impressions, some Piaget’s essays and works published in the 1950s emphasize the social context as a medium of intellectual exchange for development, using concepts like the “coordination of viewpoint” and “sharing of thought”.

As regards language, Piaget saw language as an expression of cognitive development rather than a mediator of it (Inhelder and Piaget, 1969), rejecting the idea that language is the actual basis of logical thought and its development This view of language and
thought could lead us to give more manipulative or hands-on support in the educational environment, especially for the younger learners.

Although Piaget’s theory has been considered to support a child-centered movement in education, this reflection does not seem to be an accurate one, provided that Piaget himself showed little interest in schooling and that his theory offers only very general guidelines for educational practice. It remained left to educational psychologists and educators to take into consideration the implications of Piaget’s theory for applying them in school.

Richardson (ibid: 139-140) suggests that constructivist ideas are appealing ‘to account for “emergent” properties in which the outcome (...) is greater than the sum of parts or when, as Bruner (1986) puts it, we go “beyond the information given”. There has long been a widespread feeling that general schema theory has strong implications for education. One is that the knowledge structures that a child currently has will facilitate the acquisition of additional knowledge; this in turn, has implications for how that additional knowledge should be taught and learned. The same might be said about the constructivist theory’s contribution of cognitive structures as modifiable structures.

**2.2.3 Ausubel and Bruner: A cognitive and constructivist view of learning**

If I had to reduce all of educational psychology to just one principle, I would say this: The most important single factor influencing learning is what the learner already knows. Ascertain this and teach him accordingly.

In this cite in the preceding page to his Preface, Ausubel (1968: vii), summarizes his theories of prior knowledge and meaningful learning.

Ausubel (ibid: 9) claims that,

> (t)he serious decline in knowledge and theorizing about school learning (...) can be attributed (...) to deficiencies in conceptualizations and research design, and (...) excessive concern with the improvement of particular narrowly conceived academic skills (...) rather than with discovery of more general principles.

Ausubel maintains that the essence of discovery learning, whether concept formation or problem solving, is that the content to be learned, ‘is not given but must be discovered by the learner before he can incorporate it meaningfully into his cognitive structure’ (...)

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The first phase involves rearranging information, integrating it with existing cognitive structure and reorganize the integrated combination. (ibid: 22). However, both reception and discovery learning can be rote or meaningful, depending on the conditions of the learning process. ‘The essence of the meaningful learning process (…) is that symbolically expressed ideas are related in a nonarbitrary and substantive (nonverbatim) fashion to what the learner already knows, namely, to some existing relevant aspect of his structure of knowledge (for example, an image, an already meaningful symbol, a concept, or a proposition)’ (ibid: 37-38)

The basic type of meaningful learning is representational learning, that is learning the meanings of single symbols, such as words; then, propositional learning deals with the meanings of ideas expressed by sentences; finally concept learning. Concept learning may be related to representational or to propositional learning, being the latter of a more complex nature. According to Ausubel the importance of meaningful learning lies in its potential for acquiring and storing a vast quantity of information, provided the capacity of human beings to remember only a few discrete items of information. In the same line, Bruner (1973: 4) states,

Cognitive mastery in a world that generates stimuli far faster than we can sort them depends upon strategies for reducing the complexity and the clutter. But reduction must be selective, attuned to the things that "matter". (…) (and) is heavily dependent on learning. Man constructs models of his world. (…) man can not only deal with information before him, but go far beyond the information given (…).

Bruner places intuitive thinking (short cuts and leaps from partial evidence), as a neglected but essential feature of productive thinking.

Bruner (ibid.) points out, that human beings have three different systems for representing reality. First, through action, second through ikons or images, and third through representation by symbols, that is language.

Hitherto we can see some parallels between Bruner and Ausubel theories, both giving great relevance to the role of language for developing cognition. Bruner suggests that intellectual ability develops in stages through step-by-step changes in how the mind is used. According to Ausubel (ibid.) transfer is a consequence of meaningful learning, because there is no instance of such learning that is not affected by existing cognitive
structure, therefore, this learning experience, in turn, results in new transfer by modifying cognitive structure. In Bruner’s terms (1960: 12) ‘(t)he teaching and learning of structure, (...) is at the center of the classic problem of transfer...If earlier learning is to render later learning easier, it must do so by providing a general picture in terms of which, the relations between things encountered earlier and later are made as clear as possible’.

Another common issue is the notion of readiness. Ausubel (ibid.: 175-176) defines readiness as a cumulative developmental product reflecting the influence of all genic effects, all prior incidental experience, and all prior learning on cognitive patterning and the growth of cognitive capacities. Thus it reflects the effects of subject-matter learning as well (...) Cognitive readiness refers to the adequacy of existing cognitive processing equipment or capacity for coping with the demands of a specific cognitive learning task.

to further along, state that insufficient readiness may reflect cognitive immaturity due to an inefficient educational system. In the same line Bruner (1960: 33) points out that schools have wasted a great deal of people’s time by postponing the teaching of important areas because they are deemed ‘too difficult’. ‘We begin with the hypothesis that any subject can be taught effectively in some intellectually honest form to any child at any stage of development’. This notion underpins Bruner’s idea of spiral curriculum, (which reminds of Coyle’s spiral of language progression), ‘(a) curriculum as it develops should revisit this basic ideas repeatedly, building upon them until the student has grasped the full formal apparatus that goes with them’ (ibid.: 33)

Apart from the concepts of prior knowledge, meaningful and discovery learning, there are several points that reflect parallels in Bruner’s and Ausubel’s theories with the CLIL approach. One of them is the Ausubel’s advance organizers. As Ausubel puts it,

The use of expository organizers to facilitate learning and retention of meaningful verbal learning is based on the premise that logically meaningful material becomes incorporated most readily and stably in cognitive structure insofar as it is subsumable under specifically relevant existing ideas. It follows, therefore, than increasing the availability in cognitive structure of specifically relevant subsumers- by implanting suitable organizers- should enhance the meaningful learning of such material.

Another one, in words of Bruner (1973: 60)
There is nothing more central to a discipline than its way of thinking. There is nothing more important in its teaching than to provide the child the earliest opportunity to learn that way of thinking.

Bruner coined the term “scaffolding”, which is linked to the Vygotskian Zone of Proximal Development. Scaffolding is the interaction between an adult or an expert-peer and a child, in order to enable the child to do something beyond his own possibilities, within the latent “gap” that leads to “potential” cognition. A scaffold is a temporary framework that is put up for support and access to meaning, and taken away according to the child’s progression. Thus, Bruner proposes a socio-constructivist model for schools, where culture and society have a relevant role. It may be seen here, some more implications and theoretical underpinnings to the CLIL approach. Bruner (1973: 5-6) states that,

We go not only from part to whole, but irresistibly from the particular to the general. (...) the categorizing tendency of intelligence is central — for it yields a structure of thought that becomes hierarchically organized with growth, forming branching structures in which it is relatively easy to search for alternatives.

We might say that the idea of categorization, and structures hierarchically organized is a common feature in the preceding explored theories and researchers.

2.3 The relevance of thinking skills in education

During the last decades there has been growing interest in developing child’s thinking and learning skills partly due to new knowledge about how the brain works and how people learn, and evidence that specific interventions can improve child’s thinking and intelligence, as Fisher (2006) states, and partly due to the need to cope with a rapidly changing technological environment, so that much of the value of learning lays in that learners acquire the general thinking and learning skills that they will require throughout their lives (Chipman, Segal and Glaser, 1985).

For both research and practice it is important to define what thinking skills are. In Fisher’s (ibid.) words, the term refers to the human capacity to think in conscious ways to achieve certain purposes. Such processes include remembering, questioning, forming

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5 ‘If thinking is how children make sense of learning, then developing their thinking skills will help them get more out of learning and life.’ Fisher (2006).
concepts, planning, reasoning, imagining, solving problems, making decisions and
judgments, translating thoughts into words and so on.

Many researchers have attempted to identify the key skills in human thinking; Benjamin
Bloom (1956) was the first to develop a hierarchy of six thinking skills placed on a
continuum from lower to higher order thinking skills within the cognitive domain. This
taxonomy has been recently revised by Anderson and Krathwohl (2001), a former
student and a co-author of the original taxonomy, respectively. One of their aims in this
revision has been to stress the importance of meta-cognition (ibid. 44).

There is a need to teach not only cognitive skills and strategies but also develop the
higher ‘meta-cognitive’ functions involved in meta-cognition. This implies making
learners aware of themselves as thinkers and how they process and create knowledge by
‘learning how to learn’. In the same line Brewster (1992) points out that meta-cognitive
and cognitive strategy training is especially effective in helping learners learn how to
learn. Brain research has led to the conclusion that cognitive challenge is important at
all stages in life, but especially in the early years of education.

From these views key principles emerge (Fisher, 2006) that include the need to provide:

- cognitive challenge: challenging children’s thinking from the earliest years
- collaborative learning: extending thinking through working with others
- meta-cognitive discussion: reviewing what they think and how they learn

This research and the pioneering work of Feuerstein (1979), who created a programme
called Instrumental Enrichment, Matthew Lipman (2003), founder of Philosophy for
Children, and other leading figures such as Edward de Bono (1999), creator of ‘lateral
thinking’, have inspired a wide range of curriculum and programme developments.

Other approaches include the use of ‘graphic organizers’ or ‘concept maps’ to make
thinking visual and explicit, like concept mapping, an information-processing
 technique, developed by Buzan (2006) into a version he calls Mind Mapping. Concept
maps are tools, used as well in CLIL, that help make thinking visible and involves
writing down, or drawing a central idea and thinking up related ideas which radiate out
from the centre.
In addition, new technologies research shows several ways in which ICT could enhance the teaching and learning of thinking skills. It seems that the use of computers can lead to improved information-processing skills as ICT enables multiple and complex representations of information, allowing learners to think with a richer knowledge base (Fisher, 2006).

The revised National Curriculum of the Department for Education and Skills (DfES 1999) in England included thinking skills in its rationale⁶, stating that these are essential in ‘learning how to learn’. The list of thinking skills includes:

- information processing
- reasoning
- inquiry
- creative thinking
- evaluation

They focus on ‘knowing how’ as well as ‘knowing what’, not only on curriculum content but on learning how to learn and can be closely related to Bloom’s taxonomy.

2.4 Bloom’s Taxonomy and Bloom’s Revised Taxonomy

In the late 1950s in the US there were attempts to classify the varied domains of human learning: cognitive, affective, and psychomotor. One of the most relevant was a framework for categorizing educational objectives, published by B.S. Bloom (author and editor), M. D. Engelhart, E.J. Furst, W.H. Hill, and D.R. Krathwohl (1956) as The Taxonomy of Educational Objectives, The Classification of Educational Goals, Handbook 1: Cognitive Domain.

Discussions during the 1948 Convention of the American Psychological Association had led Bloom to lead a group of educators who undertook the task of classifying educational goals and objectives. Their intent was to develop a method of classification for thinking behaviors that were believed to be important in the processes of learning.

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According to Forehand (2005) Bloom's Taxonomy is a multi-tiered model of classifying thinking according to six cognitive levels of complexity. The levels have often been compared to a stairway, encouraging students to "climb to a higher (level of) thought." The taxonomy is hierarchical because each level is subsumed by the higher levels. This divisions of lower and higher level thinking are currently referred as lower order thinking skills (LOTS) and higher order thinking skills (HOTS) and represent a continuum along the cognitive processes. Bloom's Taxonomy "has stood the test of time".

During the 1990's, a former student of Bloom's, Lorin Anderson, led a new assembly which met for the purpose of revising the taxonomy, "refocusing educator's attention on the value of the original Handbook" (...) and "incorporating new knowledge and thought into the framework"(Anderson and Krathwohl, 2001: xxi-xxii). This time "representatives of three groups: cognitive psychologists, curriculum theorists and instructional researchers, and testing and assessment specialists" were present (Anderson, & Krathwohl, 2001, p. xxviii). Published in 2001, the revision includes several significant changes in three broad categories: structure, terminology and emphasis, and the focus of the document.

The revision emphasizes the use of the Taxonomy in planning curriculum, instruction, assessment and the alignment of the three, a major shift from the original focus on assessment; and it is aimed at a broader audience, emphasizing teachers.

Changes in terminology are perhaps the most obvious difference. Bloom's six major categories were changed from noun to verb forms, in order to be consistent with how objectives are framed. The lowest level of the original, “knowledge” was renamed and became “remember”, acquiring a verb aspect and “knowledge” in its noun aspect became a separate dimension. Finally, “comprehension” and “synthesis” were renamed as “understand” and “create”. Figure 3 below, shows a graphic comparison of Bloom’s Taxonomy and Bloom’s Revised Taxonomy.
As regards structural changes, process categories do not form a rigid cumulative hierarchy in the Revised Bloom's Taxonomy and it takes the form of a two-dimensional table (see p. 31), one is The Knowledge Dimension (or the kind of knowledge to be learned, represented by nouns), the second is The Cognitive Process Dimension (or the processes used to learn, represented by verbs). Thus, the noun and verb components of objectives became separate dimensions (Anderson and Krathwohl, 2001: 305-310).

Available at: [http://www.uwsp.edu/education/lwilson/curric/newtaxonomy.htm](http://www.uwsp.edu/education/lwilson/curric/newtaxonomy.htm) [Accessed 17/06/2011]
3. DATA, METHODOLOGY AND QUALITATIVE ANALYSIS

3.1 Context of study

The present study was conducted during the first year (2010-2011) of implementation of the CLIL (AICOLE) project in the Centro de Educación Infantil y Primaria (C.E.I.P.) José Ortega y Gasset in the Autonomous Community of Madrid. The author of the current study worked as a member of the bilingual team in the role of Coordinator of the CLIL program and as Tutor of Grade 1B, teaching the subjects of English and Science. The school belongs to the Tetuán District in the north of Madrid-Capital. The curricular model of our CLIL project corresponds to ‘Model A3 Preparation for a long-term CLIL program’ according to Coyle, Hood and Marsh (2010: 19).

The composition of the school Grades during the year of implementation can be seen in Table 1 below. It can be inferred that the school was losing pupils from the base: A “line 3” school, leading to a “line 2” one. In the same Table there is the provisional prevision for the next academic year, based on the number of applications received in April and pending of a raise during the application period of September.

<table>
<thead>
<tr>
<th>Cycle</th>
<th>Grade</th>
<th>Number of groups</th>
<th>Total number of pupils</th>
<th>Grade</th>
<th>Number of groups</th>
<th>Total number of pupils</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infant</td>
<td>3yrs. A, B, C</td>
<td>3</td>
<td>72</td>
<td>3yrs. old A, B, C</td>
<td>3</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>4 yrs. A, B</td>
<td>2</td>
<td>50</td>
<td>4 yrs. old A, B</td>
<td>3</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>5 yrs. A, B</td>
<td>2</td>
<td>50</td>
<td>5 yrs. old A, B</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>First</td>
<td>1A, 1B, 1C</td>
<td>3</td>
<td>62</td>
<td>1A, 1B, 1C</td>
<td>3</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td>2A, 2B, 2C</td>
<td>3</td>
<td>72</td>
<td>2A, 2B, 2C</td>
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<td>3</td>
<td>65</td>
<td>3A, 3B, 3C</td>
<td>3</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>4A, 4B, 4C</td>
<td>3</td>
<td>69</td>
<td>4A, 4B, 4C</td>
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<td>62</td>
</tr>
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<td>3</td>
<td>66</td>
<td>6A, 6B, 6C</td>
<td>3</td>
<td>61</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>565</td>
<td>26</td>
<td>614</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Number of groups in 2010-2011 compared to the prevision for 2011-2012

AICOLE is the term uses by the CAM to address this approach: Aprendizaje Integrado de Contenidos y Lengua Extranjera.
From the above Table, it can be inferred that the gross of the applications are addressed to enter Grade 1, where the Bilingual Project is officially implemented. This has allowed the school to recuperate one group. And there are expectations of recovering the other one.

3.1.1 Social and cultural context

Between Infant 1, 2 and 3 and Primary 1 to 6, a total of about 600 pupils are attended. The socio-cultural context varies from middle to low socio-economic class, being the percentage of immigration around 40% with 28 different nationalities represented with a prevalence of Latin-American and Arab population. In Grade 1 this year the percentage of immigrant learners reached 80%. Two of the newcomers to Grade1 did not speak any Spanish: one of them spoke Portuguese and Guarani and the other Hindi and English. Regarding educational policies, the school must accept new pupils (generally coming from Latin-America, where they have a different school-year timing) all year round. For instance, this year the last new pupil entered Grade 1 in mid June.

3.1.2 A special school program previous to the implementation of CLIL: Flexible Groups

The school is provided with most of the programs available through the Consejería de Educación to cover students’ special needs, namely compensatory education, therapeutical pedagogy, logopedia, general development disorders and the like. Following the Directive Team policy initiative, in 2009, a new program called Flexible Groups was implemented. The educational drives were to attend to the individual needs of every child in the instrumental subjects of Spanish Language and Maths as early as possible. Therefore the program started in the First Cycle in Grade 1 and by 2010 it was followed in Grade 2. The term Flexible Groups responds to the fact that the pupils of each Grade remain together in their own class for all the subjects, except for Spanish Language and Maths, where homogenous groupings are made, based on the exam results rendered by the pupils at the beginning of the year. The tables below would
provide a clearer picture, and correspond to the current situation during the current first year of implementation of the CLIL program.

<table>
<thead>
<tr>
<th>First Cycle Primary</th>
<th>Number of pupils</th>
<th>Academic Level</th>
<th>Classroom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 1 A</td>
<td>21</td>
<td>heterogeneous</td>
<td>1A</td>
</tr>
<tr>
<td>Grade 1 B</td>
<td>21</td>
<td>heterogeneous</td>
<td>1B</td>
</tr>
<tr>
<td>Grade 1 C</td>
<td>21</td>
<td>heterogeneous</td>
<td>1C</td>
</tr>
</tbody>
</table>

Table 2: Distribution and placement of pupils for CLIL subjects (English, Science and Arts) and non-CLIL subjects, except Spanish Language and Maths.

<table>
<thead>
<tr>
<th>Flexible Groups</th>
<th>First Cycle Primary</th>
<th>Number of pupils</th>
<th>Academic Level</th>
<th>Criteria</th>
<th>Classroom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexible Group 1</td>
<td>Selected pupils from Grades 1 A, 1B and 1 C</td>
<td>23</td>
<td>homogeneous</td>
<td>Pupils who obtained the highest exam results.</td>
<td>1A</td>
</tr>
<tr>
<td>Flexible Group 2</td>
<td>Selected pupils from Grade 1 A, 1B and 1 C</td>
<td>23</td>
<td>homogeneous</td>
<td>Pupils who obtained the second highest exam results.</td>
<td>1C</td>
</tr>
<tr>
<td>Flexible Group 3</td>
<td>Selected pupils from Grade 1 A, 1B and 1 C</td>
<td>11</td>
<td>homogeneous</td>
<td>Pupils who obtained low results</td>
<td>1 B</td>
</tr>
<tr>
<td>Flexible Group 4</td>
<td>Selected pupils from Grade 1 A, 1B and 1 C</td>
<td>6</td>
<td>homogeneous or heterogeneous</td>
<td>Pupils who have not learnt to read, write or the basics in numeracy, or pupils who did not speak any Spanish.</td>
<td>classroom assigned in another floor.</td>
</tr>
</tbody>
</table>

Table 3: Distribution and placement of pupils for Spanish Language and for Maths

In the case of Grade 2, the total number of the three grades was higher than in Grade 1, which determined that, the Flexible Group 3, the group with lower results, had 17 pupils.

The so-called ‘philosophy’ of this program is to give each child what he needs, giving more attention to the weaker ones in a homogenous group, and especially, giving the more advanced ones, opportunities to reach a greater development provided that, there is the belief that there have been many resources established by the educational
authorities for the former and none for the latter. As regards materials, in the Flexible Groups 1, 2 and 3, the same textbooks are followed, except that at a different pace.

In practical terms, this grouping meant that this year, in Grade 1 Primary eleven different teachers have had intervention, provided that Spanish Language, and Maths were given by different teachers, aside from Music, Physical Education, and Religion or what is called Alternative subject. It also had influence in some aspects of the implementation of the CLIL program that will be considered further on.

This introduction aims to reflect the complexity of the whole school context.

3.1.3 The CLIL program at the school

The bilingual team was composed by four teachers, two of them in the role of tutors as well. Whenever possible the same teacher would give the three subjects, namely English Language, Science and Arts. As there were some external and internal organizational impediments, the final schedule remained as can be seen in Table 4.

<table>
<thead>
<tr>
<th>Subjects and Tutory</th>
<th>Grade 1 A</th>
<th>Grade 1 B</th>
<th>Grade 1 C</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>Teacher 1</td>
<td>Teacher 2</td>
<td>Teacher 3</td>
</tr>
<tr>
<td>Science</td>
<td>Teacher 2</td>
<td>Teacher 2</td>
<td>Teacher 3</td>
</tr>
<tr>
<td>Arts</td>
<td>Teacher 4</td>
<td>Teacher 3</td>
<td>Teacher 3</td>
</tr>
<tr>
<td>Tutor</td>
<td>Non-Clil tutor</td>
<td>Teacher 2</td>
<td>Teacher 3</td>
</tr>
</tbody>
</table>

Table 4: Schedule of subjects and corresponding teachers

Sessions per week:
- English: 5 sessions.
- Science: 4 sessions.
- Arts: 1 session.
- Conversation in small group: 1 hour, divided in two 30 minutes sessions.\(^9\)

Length of the sessions: the length was variable among the 3 groups. For instance, in 1B Science lessons took a total of 3 hours, whilst in 1A they took 3.30 hours.

\(^9\) The two Language Assistants, under the direct supervision of the Coordinator, attended a group of 4 pupils in each session. Thus, 4 groups (16 pupils) benefit from oral training.
3.2 Data and Methodology

3.2.1 Data collection

The data consisted of the content subject information and the students’ activities provided in the Unit of Plants in the Science Textbooks for Grade 2 Primary below:

4. Social and Natural Sciences 2. Look and Think. Oxford Educación, 2010. Unit 3: Plants. This textbook contains some resources like flashcards and opening stories that the other textbooks do not have.

The textbooks were chosen according to the following criteria:

- They were textbooks of recent publication specifically addressed to the Spanish CLIL program.
- The years of publication covered an appropriate range so as to provide some sort of development of the published material, especially within the two Textbooks from the same publisher (i.e. Oxford 2005-2010).
- They were textbooks in current use in different bilingual schools in the Autonomous Community of Madrid.

As regards the topic chosen, namely “Plants”, it was selected because its amenability of further longitudinal research provided that it is studied along several grades of Primary, being a common unit in the publishers studied. Moreover it was one of the most homogeneous topics to be compared among the four textbooks, homogeneous meaning that the information provided was comparable, while in units like “Our Body”, or “Animals” the content was too varied for a fair contrastive study.
3.2.2 Data of the current study

The corpus of the study consisted of:

- The content information provided in each unit by the textbook, which was labelled as T (textbook information or content for students to know or learn).
- The activities that the students were required to do in the textbook, which were labelled as S.
- Both T and S were recoded, by assigning a correlative number, respectively, in each textbook, so that the analysis was clearer and no overlapping occurred.
- The total number of T's (textbook information of content) analyzed and classified is of 27 instances.
- The total number of S's (students’ activities) analyzed and classified is of 53 instances.

To have a picture of the distribution of these instances, see Table 5 below.

<table>
<thead>
<tr>
<th>Publishers</th>
<th>T = Textbook information</th>
<th>S = Students’ activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxford 2005</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Edebe 2007</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>Anaya 2007</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Oxford 2010</td>
<td>9</td>
<td>25</td>
</tr>
<tr>
<td>TOTAL</td>
<td>27</td>
<td>53</td>
</tr>
</tbody>
</table>

Table 5: Distribution of the number of Textbook information (T) and Students’ activities analyzed (S)

3.3 Methodology

The aim of the current study is to analyze the teaching of thinking skills from lower to higher order in CLIL primary Science textbooks following a qualitative analysis of the data abovementioned based on the Bloom’s Revised Taxonomy (BRT) by Anderson and Krathwohl (2001) as instrument of analysis of the thinking skills in conjunction with the language exponents of the cognitive functions.
3.3.1 Instrument of Analysis: Taxonomy Table from Bloom’s Revised Taxonomy

Bloom’s Revised Taxonomy (BRT) was selected as instrument of analysis of the thinking skills, because as Anderson and Krathwohl (2001) state it is based on pedagogical principles such as meaningful learning; transfer and categorization (Bruner 1956, 1973), and constructivism. Moreover, Bloom’s Taxonomy and BRT is referred to in many CLIL scholar’s works (Brewster n.d.; Bentley n.d.; Coyle, 2010) and specifically, two of the 4Cs Coyle’s framework, namely cognition and content have a parallel with the two dimensions in the Taxonomy Table: the Knowledge Dimension (content) and the Cognitive Processes Dimension (cognition).

Thus, the instrument of analysis was the two-dimensional Taxonomy Table of the Bloom’s Revised Taxonomy (BRT), see Table 6 below.

<table>
<thead>
<tr>
<th>THE KNOWLEDGE DIMENSION</th>
<th>THE COGNITIVE DIMENSION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. REMEMBER</td>
</tr>
<tr>
<td>A. FACTUAL KNOWLEDGE</td>
<td></td>
</tr>
<tr>
<td>B. CONCEPTUAL KNOWLEDGE</td>
<td></td>
</tr>
<tr>
<td>C. PROCEDURAL KNOWLEDGE</td>
<td></td>
</tr>
<tr>
<td>D. META-COGNITIVE KNOWLEDGE</td>
<td></td>
</tr>
</tbody>
</table>

*Table 6: The two-dimensional Bloom’s Revised Taxonomy Table*

As can be seen in Table 6, the Knowledge Dimension on the left side is composed of four levels that are defined as Factual, Conceptual, Procedural, and Meta-Cognitive. The Cognitive Process Dimension across the top of the grid consists of six levels that are defined as Remember, Understand, Apply, Analyze, Evaluate, and Create. Each level of both dimensions of the table is subdivided.

Each of the four Knowledge Dimension levels is subdivided into either two or three categories. The Cognitive Process Dimension levels are also subdivided. The resulting
grid, containing 19 cognitive subcategories is most helpful to teachers in placing objectives, instructional activities and assessment tasks in their corresponding cells. In other words, the Taxonomy Table can help educators in at least three ways:

- Gain a more complete understanding of their objectives, “the learning question”.
- Make better decisions about how to teach and assess their students in terms of the objectives, “the instructional question”.
- Determine how well the objectives, instructional activities and assessments tasks fit together in a meaningful and useful way, “the alignment question”.¹⁰ (Anderson and Krathwohl, 2001: 95)

The terms in the Cognitive Process Dimension are defined as:

- **Remember**: Recognizing (identifying), and recalling (retrieving) relevant knowledge from long-term memory.
- **Understand**: Constructing meaning from oral, written, and graphic communication through interpreting (representing), exemplifying (instantiating), classifying (categorizing), summarizing (abstracting), inferring (predicting), comparing (matching), and explaining (constructing cause-effect models).
- **Apply**: Carrying out or using a procedure through executing (perform a familiar task), or implementing (perform an unfamiliar task)
- **Analyze**: Breaking material into constituent parts, determining how the parts relate to one another and to an overall structure or purpose through differentiating (distinguishing), organizing (finding coherence), and attributing (deconstructing).
- **Evaluate**: Making judgments based on criteria and standards through checking (monitoring) and critiquing (judging).

---
¹⁰ Alignment refers to the degree of correspondence among the objectives, instruction and assessment. When notations for all three, objectives, activities and assessments appear together in the individual cells of the table then we can talk of strong alignment. If some cells contain two of them, the alignment is weaker. Many cells containing only one of them are the result of weakest alignment (Anderson & Krathwohl, 2001)
• **Create**: Putting elements together to form a coherent or functional whole; reorganizing elements into a new pattern or structure through generating (hypothesizing), planning (designing), or producing (constructing).

(Anderson and Krathwohl, 2001: 67-68)

The terms in the Knowledge Dimension are defined as follows:

• **Factual knowledge**: The basic elements students must know to be acquainted with a discipline or solve problems in it.

• **Conceptual knowledge**: The interrelationships among the basic elements within a larger structure that enable them to function together.

• **Procedural knowledge**: How to do something, methods of inquiry, and criteria for using skills, algorithms, techniques, and methods.

• **Meta-cognitive knowledge**: Knowledge of cognition in general as well as awareness and knowledge of one’s own cognition,

(Anderson and Krathwohl, 2001: 46)

For a clearer picture of the two dimensions, their corresponding subdivisions, and a brief definition of each main knowledge and cognitive categories, see Table 7 and Table 8 in the following pages (p.35-36).
Table 7: BRT by Anderson and Krathwohl (2001) adapted by Coyle (2010)

<table>
<thead>
<tr>
<th>The Cognitive Process Dimension</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lower-order processing:</strong></td>
<td></td>
</tr>
<tr>
<td>Remembering</td>
<td>Such as producing appropriate information from memory, e.g.</td>
</tr>
<tr>
<td></td>
<td>• Recognizing</td>
</tr>
<tr>
<td></td>
<td>• Recalling</td>
</tr>
<tr>
<td>Understanding</td>
<td>Meaning: making from experiences and resources, e.g.</td>
</tr>
<tr>
<td></td>
<td>• Interpreting</td>
</tr>
<tr>
<td></td>
<td>• Exemplifying</td>
</tr>
<tr>
<td></td>
<td>• Classifying</td>
</tr>
<tr>
<td></td>
<td>• Summarizing</td>
</tr>
<tr>
<td></td>
<td>• Inferring</td>
</tr>
<tr>
<td></td>
<td>• Comparing</td>
</tr>
<tr>
<td></td>
<td>• Explaining</td>
</tr>
<tr>
<td>Applying</td>
<td>Such as using a procedure, e.g.</td>
</tr>
<tr>
<td></td>
<td>• Executing</td>
</tr>
<tr>
<td></td>
<td>• Implementing</td>
</tr>
<tr>
<td><strong>Higher-order processing:</strong></td>
<td></td>
</tr>
<tr>
<td>Analysing</td>
<td>Breaking down a concept into its parts and explaining how the parts relate to the whole, e.g.</td>
</tr>
<tr>
<td></td>
<td>• Differentiating</td>
</tr>
<tr>
<td></td>
<td>• Organizing</td>
</tr>
<tr>
<td></td>
<td>• Attributing</td>
</tr>
<tr>
<td>Evaluating</td>
<td>Making critical judgements, e.g.</td>
</tr>
<tr>
<td></td>
<td>• Checking</td>
</tr>
<tr>
<td></td>
<td>• Critiquing</td>
</tr>
<tr>
<td>Creating</td>
<td>Putting together pieces to construct something new or recognizing components of a new structure, e.g.</td>
</tr>
<tr>
<td></td>
<td>• Generating</td>
</tr>
<tr>
<td></td>
<td>• Planning</td>
</tr>
<tr>
<td></td>
<td>• Producing</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The Knowledge Dimension</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Factual knowledge</td>
<td>Basic information, e.g.</td>
</tr>
<tr>
<td></td>
<td>• Terminology</td>
</tr>
<tr>
<td></td>
<td>• Specific details and elements</td>
</tr>
<tr>
<td>Conceptual knowledge</td>
<td>Relationships amongst pieces of a larger structure that make them part of the whole, e.g.</td>
</tr>
<tr>
<td></td>
<td>• Knowledge of classifications and categories</td>
</tr>
<tr>
<td></td>
<td>• Knowledge of principles and generalizations</td>
</tr>
<tr>
<td></td>
<td>• Knowledge of theories, models and structures</td>
</tr>
<tr>
<td>Procedural knowledge</td>
<td>How to do something, e.g.</td>
</tr>
<tr>
<td></td>
<td>• Knowledge of subject-specific skills and algorithms</td>
</tr>
<tr>
<td></td>
<td>• Knowledge of subject techniques and methods</td>
</tr>
<tr>
<td></td>
<td>• Knowledge of criteria for determining when to use appropriate procedures</td>
</tr>
<tr>
<td>Metacognitive knowledge</td>
<td>Knowledge of thinking in general and individual thinking in particular, e.g.</td>
</tr>
<tr>
<td></td>
<td>• Strategic knowledge</td>
</tr>
<tr>
<td></td>
<td>• Knowledge about cognitive tasks</td>
</tr>
<tr>
<td></td>
<td>• Self-knowledge</td>
</tr>
</tbody>
</table>

11 Lower and higher order thinking skills associated with the three bottom and the three top levels actually represent a continuum.
Table 8: The Taxonomy Table\textsuperscript{12} by Anderson and Krathwohl (2001) adapted by Santo-Tomás (2011)

Table 8 with its 24 cells was used to place each piece of Textbook information (T) and all the Students activities (S) according to the thinking skill or cognitive process they activated and according the type of Knowledge they represented.

\textsuperscript{12}Anderson and Krathwohl refer to each cell as A1 to A6, B1 to B6, C1 to C6 and D1 to D6. Therefore this has been the nomenclature followed when categorizing the data in the Taxonomy Table, though there were as well added the categories and subcategories denominations for reader friendliness.
3.3.2 Instrument of analysis: language exponents

As already mentioned (see p. 13), language exponents are the different language formulations for performing a language function and represent functional language within the BICS or within the CALP. The rationale for this kind of language being associated with thinking skills is that in CLIL programs, learners and teachers “need to know explicitly which thinking processes subjects regularly require learners to engage in and how to express them in L2” (Clegg, 2007: 123). While, in L1 it is not common to teach explicitly the thinking skills required by a subject nor their associated language exponents, in CLIL programs teachers providing language support, need to have recourse to lists of thinking processes and their language exponents, because these sets of phrases constitute the language demands made on learners in oral and written tasks from the lowest age groups upwards (Clegg, ibid.) An example of such sets of phrases associated to definition and classification functions are provided below in Table 8 and Table 9.

| Table 9: Thinking process (Defining) and their language exponents. (Clegg, 2007) |
Table 10: Thinking process (Classifying) and their language exponents. (Clegg, 2007)

Scholars like Brewster (n.d.)\(^\text{13}\) point out how publications on thinking skills have begun to start linking thinking skills with the language required. However, as regards the current study, language exponents that provided the exact name of the function (e.g. define, classify, etc.) as in Clegg’s tables were valued as highly explicit compared to

\(^{13}\text{Available at } \text{http://www.onestopenglish.com/thinking-skills-for-clil/501197.article} \text{ [Last accessed 18/06/2011]}\)

1. **Remember**
   Questions using who, what, where, when, which how, how much?
   Tasks using describe, choose, define, find, label, color, match, underline key vocabulary in different colors (e.g. parts of a system and functions)
   Language: That’s a … (because it has …) and … This is a … and this is what it does.
   This has… This is a kind of … which/that … A … is a kind of… which/that …
   This goes with this.

2. **Understand**
   Questions using is this the same as…? What’s the difference between…? Which part doesn’t fit or match the others? Why?
   Tasks using classify, explain, show what would happen if… give an example, show in a graph or table, use a Venn diagram or chart to show…
   Language: This is … (a kind of…) but that one isn’t (because…) This has (a type of…) but that one doesn’t/hasn’t (because…). These are all types of …because This belongs! goes here because…If we do this then…This leads to…This causes …

3. **Apply to new situations (Implementing)**
   Questions using what would happen if…? What would result in…? How much change is there if you …?
   Tasks using Explain what would happen if… Show the results of…
   Language: What shall we try/ do first? If we try this then … that could be… First we thought about… then we… This must be … because…
   It can’t be …because…

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circumlocutory ones such as ‘this is a…and this is what it does’, which were valued as conferring a low degree of explicitness.

3.3.3 Procedure

The procedure followed was to examine the content information provided by the textbook (T) and every student activity (S) in each Unit in the following way:

1. A thorough and in-depth study of the Bloom’s Revised Taxonomy was undertaken, especially as regarded the definitions of each category and subcategory, as well as the examples provided for the placement of objectives, instructional activities and assessment tasks in the categories and subcategories of the Taxonomy Table.

2. A distinction was made between Ts (Textbook content information) and Ss, activities required from Students to do), in order to number them correlative along all the unit and taking into account that some student’s activities were embedded in the textbook information in the form of questions.

3. Each activity or piece of information was placed in their corresponding cell (cell meaning the intersection of each of the cognitive categories with the corresponding knowledge category dimension). For that purpose an inter-rater reliability procedure\(^\text{14}\) was undertaken.

4. After categorizing all the data, an explanation of the reasons for that categorization was provided. When necessary, definitions of the cognitive processes were provided for better understanding.

5. An exposition of the language exponents associated to each function was followed in order to determine the degree of explicitness in stating each function.

6. It was as well decided if the function (cognitive process or thinking skill) belonged to lower or higher order thinking, bearing in mind that higher order thinking skills represent a continuum and can be activated within the two lower levels “Understand” and “Apply”. “Remember” is closely related to retention, while the other five cognitive processes are increasingly related to transfer.

\(^{14}\) The first rater was the author of the current study. The second was a Language Assistant, who had been using similar textbooks and was familiar with the subject discipline. The third rater used in the survey, was also a Primary teacher with years of experience and familiarity with the discipline. The three raters held regular meetings to confirm the analysis and categorize the findings.
7. The analysis of the textbook information (T) and students’ activities (S) was in some occasions followed by observations, either of pedagogical implication nature, or either stating contrastive analysis among them. The rationale for this procedure was to facilitate the understanding of an exhaustive analysis, especially when reaching the Findings and Discussion Chapter, where, in the absence of immediacy of the textbooks’ images and text, it would have been difficult to follow certain observations.

8. The four textbooks analyzed appear in chronological order according to their publishing date.

3.4 Analysis of data and observations

The classification of the information and activities has been an agreement among two inter-raters and the author of the present study, trying to be as accurate as possible consistent with the definitions given by the authors of the Bloom’s Revised Taxonomy. As Anderson and Krathwohl point out, analyzing units prepared by others requires “to take the stance of an observer attributing intended meaning to objectives, instructional activities and assessments” (Anderson and Krathwohl 2001: 95). Therefore, being the task in many occasions a bit difficult and confusing, the results of our classification are open to further revisions.

The content information provided by the textbooks has been considered as objectives of learning, while the students’ activities represent instructional activities, which should be aligned with the learning objectives.

This section will be developed as follows: First, the global Taxonomy Table with its two dimensions will be shown for clarifying purposes, followed by a qualitative analysis of the content information and activities. The images of the textbooks have been placed in the body of the analysis instead of in the Appendices, to facilitate the task of comparing the data analysis with the data collection.
Table 11: The Taxonomy table: Unit 13 Plants (Social and Natural Sciences 2 Primary Oxford, 2005)

T = Information provided by the Textbook in written form or by means of labeled pictures
S = Activities that Students are required to do in the textbook
3.4.1 Unit 13 Plants (Social and Natural Sciences 2 Primary Oxford 2005)

Page 114: T₁ and S₁

T₁: All the written and graphic information provided by the textbook has been placed in cell 1A Remember (Recognizing) Factual Knowledge of terminology and specific details and elements, because it is intended for students to acquire knowledge of the definition of plants as living things and their vital functions. As pointed out by Anderson and Krathwohl (2001), it was hard to decide between Factual knowledge (A): basic elements in an academic discipline, and Conceptual knowledge (Ba): knowledge of classifications and categories. T₁ was finally placed in cell 1A Remember (Recognizing) Factual Knowledge, provided the simplicity of the definition and the use of graphics. There is one more criterion that determined this placement, following the authors, ‘classifications

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15 As a reminder: T₁ corresponds to information given by the textbook, and S₁ to students’ activities. They will be correlative numbered along this entire Unit.
are by large the result of agreement and convenience, whereas knowledge of specific details stems from observation, discovery and experimentation’ (ibid: 49). Therefore, here we have a definition of living things and the “classification” of plants as such, but considering this “classification” as Factual knowledge.

The language exponents confer a low degree of explicitness to the defining function: ‘what something is and what it does’.

The level is LOTS.

S1: The students’ activity was placed in cell 4B Analyze (Organizing) Conceptual knowledge.

At first sight it was striking that the definition in T1 which included the functions of living things be placed in Remember and Factual knowledge, while this sequencing over the same vital functions be placed in such a high order cell. However, these sequencing activities whether temporal, spatial, or conceptual are difficult challenges for young students and on the other hand they are activities with a high degree of presence in school activities, perhaps because they help training youngsters in grasping the level of abstraction they convey.

The exponent language: ‘order the series from 1 to 4’, provides explicitness to the function.

As stated it belongs to HOTS.
Page 115: T₂ and S₂

T₂: Placed in cell 2B Understand Conceptual knowledge of classifications. The written text belongs to Understand (Classifying) and the labeled pictures with the names of the plants and their corresponding classifications belonging to Understand (Exemplifying).

The language exponent “X can be” and the descriptive language of the corresponding features provide a low degree of explicitness to the function. The level would correspond to LOTS.

S₂: Placed in cell 1A Remember (Recognizing) Factual knowledge of terminology.

The language exponent ‘what type of’ provides certain explicitness to the function of classifying but the activated function would be identifying, recognizing the terminology for a stated classification. There could be claims of this activity belonging to Understand in its Classifying subcategory, but then more instances of different plants would be necessary. The activity belongs to LOTS.
Page 116: T₃ and S₃

T₃: Placed in cell 1B Remember Conceptual knowledge. The cognitive category is Remember, because so far the definition as given here does not demand a construction of meaning, but recognizing and recalling.

The language exponents, ‘what something is and what it does’ is not sufficient here to make the defining function explicit (see criteria for language exponents in chapter 3 p. 38)

The function is considered as belonging to LOTS.

S₃: Placed in 1A, Remember (Recognizing) Factual knowledge of terminology.

As can be seen, students are not required to account for their recognizing of the functions related to the terms in the definition stated in T₃, which represents some misalignment.

The language exponent, “label” makes the identifying or recognizing function explicit.

It would be LOTS.
Page 117: T₄, T₅ and S₅

The textbook information has been divided in two parts T₄ and T₅ because though it is presented altogether, the last line of the paragraph (‘fruits can be nut or fleshy’) corresponds to a different cognitive category as can be seen in the pictures below it.

T₄: Placed in cell 1A Remember factual knowledge following the same criteria as in T₁. The definition is given in terms of description.

The language exponent is not sufficient to present the definition explicitly.

It could be considered as LOTS.

T₅: Placed in cell 2A Understand (Classifying) Factual knowledge of specific details and elements.

The language exponent “can be _____ or _____” provides a low degree of explicitness.

It belongs to LOTS.
S5: Placed in cell 1A Remember (Recognizing) Factual knowledge. There was certain disagreement and doubts whether placing it in 1B Remember (Recognizing) Conceptual knowledge of classifications. On the one hand the activity appeared as too simple because of the pictures above, which called for identifying more than for classifying. Moreover the absence of any language exponents, not even the minimum instructions of choosing between ‘nuts or fleshy fruit’, made it very difficult to decide in favor of 1B, which should be the intended knowledge to activate.

No explicitness.

As presented, the activity calls for lots.

Page 118: Tc and S6a, S6b
**Te:** Placed in cell 2B Understand (Explaining) Conceptual knowledge because it is an explanation about reasons why plants are important for life.

The language exponent, “because”, confer explicitness to the function.

The statement provided by the textbook includes reasons, therefore it belongs to HOTS.

**Sea:** Placed in cell 3A Apply (Executing) Factual knowledge of specific details.

Although this research may result difficult for young learners who will have to be guided in researching on the Internet or in encyclopedias, the activity apparently implied only Executing.

It was not considered as Implementing (applying a procedure to an unfamiliar task) in a strict sense because it had been stated above that “we eat the stem, the leaves and the fruit of different plants”. However, there was some discussion and emerging doubts, provided that there had not been enough amount of previous information and the question of placing the activity in the subcategory of Implementing remained open.

The language exponent is explicit.

The level is HOTS.

**Seb:** In this case the placement in cell 3A Apply within the subcategory of Implementing was a general agreement.

The language exponent is explicit.

The level is HOTS because of the implementing function.
Page 119: S7, S8, S9 and S10

S7: Placed in cell 2A Understand (Classifying and Comparing /Matching) Factual knowledge. The cognitive process is considered to be more complex provided that learners have not only to identify, but to compare and match the descriptions according to the classification recalled. Recalling is a more challenging cognitive process than Recognizing. The language exponent “match, type of, and description” confers explicitness. The level is LOTS.

S8: Placed in cell 1A as Recalling Factual knowledge. The four statements contain embedded definitions of three parts of the plant, namely roots, stem and leaves and details of fruit and seeds. There are no clear language exponents, thus the defining function is implicit. The activity belongs to LOTS.
$S_9$: Activity placed in cell 1A Remember (Recognizing) Factual knowledge though dealing with classification for the reasons abovementioned (cfr. $T_1$, $T_4$, $S_2$, $S_5$, $S_7$). The language exponent, “circle”, confers explicitness to the identifying (recognizing) function.
It belongs to LOTS.

$S_{16}$: Placed in cell 1A Remember (Recalling) Factual knowledge.
No language exponent such as “list”, therefore the recalling function is implicit.
It belongs to LOTS.
The Taxonomy Table: Unit 5 Plant Life (Science 2 Close Up Anaya, 2007)

<table>
<thead>
<tr>
<th>The Knowledge Dimension</th>
<th>The Cognitive Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. REMEMBER</strong>&lt;br&gt;1.1 Recognizing&lt;br&gt;1.2 Recalling</td>
<td><strong>2. UNDERSTAND</strong>&lt;br&gt;2.1 Interpreting&lt;br&gt;2.2 Examining&lt;br&gt;2.3 Classifying&lt;br&gt;2.4 Summarizing&lt;br&gt;2.5 Inquiring&lt;br&gt;2.6 Comparing&lt;br&gt;2.7 Explaining</td>
</tr>
<tr>
<td><strong>A. FACTUAL KNOWLEDGE</strong>&lt;br&gt;Aa. Knowledge of Terminology&lt;br&gt;Aa. Knowledge of Specific Details and Elements</td>
<td><strong>T1 T4</strong></td>
</tr>
<tr>
<td><strong>S1 S2 S3 S4</strong></td>
<td><strong>T5</strong></td>
</tr>
<tr>
<td><strong>B. CONCEPTUAL KNOWLEDGE</strong>&lt;br&gt;Ba. Knowledge of Classifications and Theories&lt;br&gt;Bb. Knowledge of Principles and Generalizations&lt;br&gt;Bc. Knowledge of Theories, Models, and Structures</td>
<td><strong>T2 T3</strong></td>
</tr>
<tr>
<td><strong>S5</strong></td>
<td><strong>S3</strong></td>
</tr>
<tr>
<td><strong>C. PROCEDURAL KNOWLEDGE</strong>&lt;br&gt;Ca. Knowledge of Subject-Specific Skills and Algorithms (Rules, Procedures)&lt;br&gt;Cb. Knowledge of Subject-Specific Techniques and Methods&lt;br&gt;Cc. Knowledge of Criteria for Determining When to Use Appropriate Procedures</td>
<td><strong>S6 S7</strong></td>
</tr>
<tr>
<td><strong>D. META-COGNITIVE KNOWLEDGE</strong>&lt;br&gt;Da. Strategic Knowledge&lt;br(Db. Knowledge About Cognitive Tasks, Including Appropriate Contextual and Conditional Knowledge&lt;br&gt;De. Self-Knowledge)</td>
<td><strong>S8</strong></td>
</tr>
</tbody>
</table>

Table 12: The Taxonomy Table: Unit 5 Plant Life (Science 2 Close Up Anaya, 2007)

T = Information provided by the Textbook in written form or by means of labeled pictures
S = Activities that Students are required to do in the textbook
3.4.2 Unit 5 Plant Life (Science 2 Close Up Anaya, 2007)

Page 40: T₁

T₁: Placed in cell 1A Remember (Recognizing) Factual Knowledge of terminology.
There is no language exponent in the text, so the function is implicitly presented.
It belongs to LOTS.
Page 41: $S_1$, $S_2$ and $S_3$

$S_1$: Placed in cell 1A Remember (Recognizing) Factual knowledge of specific details and elements. The words correspond to vital functions of living things, however, there is no information of this topic in $T_1$ and therefore, there is misalignment.

The language exponent “color” makes the identifying function explicit.
It belongs to LOTS.

$S_2$: Placed in cell 1A Remember (Recognizing or Identifying) Factual knowledge of terminology.

The language exponents “match” confer explicitness to the identifying function.

The activity is related to LOTS, because the “matching” does not involve the subcategory of Comparing belonging to Understand. It is a mere Identifying task. There is some alignment with $T_1$ in which four names of plants can be read.
S₃: Placed in cell 4B Analyze (Organizing or finding coherence) Conceptual knowledge, provided that it implies sequencing. The language exponent “number” gives an idea of temporal sequencing, so the function becomes explicit. The level of difficulty would correspond to HOTS. There is no alignment with any T.

Page 42: T₂

T₂: Placed in cell 2B Understand Conceptual knowledge. The possibility of placing it in 1A Remember Factual knowledge, or 1B Remember Conceptual knowledge was considered, however as the text encloses a great deal of factual information, of terminology, descriptions, definitions and even a cause-effect statement (“when the leaves have enough sunlight…”) T₂ as a whole has been considered to activate the
cognitive process of Understand within its subcategories of Interpreting, Exemplifying (by means of visual support) and Explaining Conceptual knowledge.

The language exponents for the functions covered, such as ‘what each term is’, and ‘what it does’ do not confer explicitness to the defining.

The information is too dense and lacks an adequate follow up activity for students to do, thus there is misalignment.

Page 43: **T₃**

**T₃:** Placed in cell 2B Understand (Classifying) Conceptual knowledge of classifications. In this case it is easier to assimilate the amount of information because, apart from the new terminology, there is only one function involved, the classifying one. Again there is no corresponding activity for the students to do (misalignment)

In this case the exponent language confers a low explicitness to the function.

It would belong to LOTS.
Placed in cell 1A Remember Factual knowledge of terminology and specific details. Although it contains a bit of cause-effect information “when we plant a seed, a new plant grows”, this information is delivered more as a fact than as an explanation. The “one stone” or “a lot of seeds” distinction was as well considered as a specific detail instead of a classification, because of its simplicity. Finally, the statement about the edibility of the seeds of some plants does not deepen in the various ways in which plants are important for animals and people. The language exponents confer low explicitness to the function. It is LOTS and again it promotes rote learning.
Page 45: $S_4$ and $S_5$

$S_4$: Placed in cell 1A Remember (Recognizing) Factual knowledge of specific details which is consistent with the alignment question, provided its corresponding instructional information $T_4$ is in the same cell. This activity is the first one the students are required to do after all the previous $T_2$, $T_3$, and $T_4$ information provided. There is language exponent “___ or ___” that confers low explicitness to the identifying function. It is LOTS.

$S_5$: Placed in cell 1A Remember (Recognizing) Factual knowledge. However, the activity has more an assessment than an instructional format. And it is not consistent with the alignment question, provided that its corresponding instructional information $T_2$ was placed in cell 2B Understand Conceptual knowledge. The language exponent “true or false” gives explicitness to the Recognizing function and to the assessment format.
The “listen and check” initiate young learners in checking the correctness of their own answers, but it could be said that it does not have an exact correspondence with the cognitive category of Evaluate in its Checking subcategory, provided that Checking involves testing for internal inconsistencies in an operation or product. It is LOTS.

Page 46: T₅ and S₆

T₅: It was agreed to place this information in cell 3A, Apply Factual knowledge maybe, because the instructional information deals with executing procedures with plants along history and because this information goes beyond the topic of plants into cross-curricular subjects. However, it could also be placed in cell 1A, Remember Factual knowledge which would be easier to justify. The language used makes explicit how people in the past applied certain procedures to the use of plants and what for. It belongs to LOTS.
\textbf{S}_6: Placed in cell 3C Apply (Executing) Procedural knowledge. Students have to follow certain rules and procedures to get to do it.

There are language exponents, therefore the function is explicit. Students have to carry out a familiar task by means of coloring the path to find the way out.

This type of task usually activates HOTS because it is not easy for young children to find the easiest way and not to overlap or get mingled, but especially in this case in which the maze is not very clearly drawn.

\textbf{Page 47: S}_7 \text{ and } \textbf{S}_8

\textbf{S}_7: Placed in cell 3C Apply (Implementing) Procedural knowledge, because young students are used to matching exercises but in a more familiar way.
There are language exponents, “match”. The function is explicit.
It belongs to HOTS because the rules and procedures needed for this activity imply a lot of observation and a high degree of abstract thinking. Moreover the silhouettes should have been more accurate.

**Ss:** Placed in cell 1D Remember (Recognize) Meta-cognitive self-knowledge.
There are language exponents, ‘circle what you know’ and ‘I can…’, that make the function explicit. It belongs to HOTS.
### Table 13: The Taxonomy Table: Unit 9 Plants (*People on Earth* 2 Edebé, 2007)

<table>
<thead>
<tr>
<th>Knowledge Dimension</th>
<th>Cognitive Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. REMEMBER</td>
<td>1. RECALLING</td>
</tr>
<tr>
<td>2. UNDERSTAND</td>
<td>2. INTERPRETING</td>
</tr>
<tr>
<td>3. APPLY</td>
<td>3. EXECUTING</td>
</tr>
<tr>
<td>4. ANALYZE</td>
<td>4. DIFFERENTIATING</td>
</tr>
<tr>
<td>5. EVALUATE</td>
<td>5. CHECKING</td>
</tr>
<tr>
<td>CREATE</td>
<td>6. GENERATING</td>
</tr>
</tbody>
</table>

*T* = Information provided by the Textbook in written form or by means of labeled pictures

*S* = Activities that Students are required to do in the textbook

*T₇* = Rothkopf (1970, 1976): Use of explicit stated objectives as an extra-textual support for students to know about what they are expected to learn.
Page 96: $T_1$ and $S_1$

$T_1$: The definition of plants as living things was placed in cell 1A Remember Factual knowledge. Secondly, the explicit statement of the four objectives of the Unit (see footnote in Table 3) for the students to know what they are expected to learn was placed cell 1D Remember (Recognize) Metacognitive knowledge. However it may not correspond exactly to any of the subtypes of Metacognitive knowledge in this Taxonomy but to metacognitive awareness of what they are expected to learn.

The language exponents explicit the functions “____ are____ and have____” and “What to learn”

It is LOTS.

$S_1$: Placed in cell 1A Remember (Identifying or Recognizing) Factual knowledge of terminology.

The language exponents “circle” imply explicitness for the identifying function.

It is LOTS.
Page 97: T₂ and S₂

T₂: Placed in cell 1A Remember Factual knowledge of terminology and specific details such as the fact that each part of the plant performs a different function. The textbook provides some examples of the functions without relating them to the part of the plant to which they correspond. This seems to be a way of scaffolding the students’ activity that follows up this information.

There are language exponents “the________ are______” and “each _____ performs a function”, that provide a low degree of explicitness to the identifying and defining function.

It is LOTS.

S₂: Placed in cell 2B Understand Conceptual knowledge. Students have to read the functions and descriptions in the boxes and to assign them one of the six parts of the plant whose names appear labeling the picture. This activity goes beyond Identifying, entailing the cognitive process of Understand within its subcategories of Inferring and
Comparing, provided that the definitions have not been taught from a teacher’s centered (or textbook centered) approach, which would lead to a Remember cognitive process. The language exponents do not make the Defining function explicit. It is HOTS.

Page 98: T₃ and S₃

T₃: Placed in cell 1A, Remember Factual knowledge (revisited) and new factual knowledge of specific details. It does not appear to be a classification. The language exponents lead to error because it seems to refer to a classification. The Remember (Identifying) function is not explicit.
As regards the concept of root\(^{16}\), the examples are as well confusing provided that the carrot is in itself a root whereas the leek is a stem with tiny thin roots at its bottom.

It is LOTS.

\( S_3 \): Placed in cell 2A, Understand (Comparing) Factual knowledge of specific details.

The same can be said about the accuracy of the topic. The onion and the garlic are swollen leaves with stem while the radish and the beetroot are roots.

The language exponents “match” make the Comparing function explicit.

It is LOTS.

\[ \text{http://en.wikipedia.org/wiki/Edible_plant_stems} \]

\( T_4 \): Placed in cell 2B, Understand (Classifying) Conceptual knowledge. As in \( T_3 \) there is a revisiting of the definition of stem followed by the classification of plants according to their type of stem. However, in this textbook the classification is narrowed to two types
of stems, incorporating bushes (which they name shrubs) to trees with which they state a binary classification.

The language exponents do not help to make the classifying function explicit.

It would be LOTS.


It implies conceptual knowledge of classifications. However in this activity young students need to compare the type of stem, watch how they are different and decide whether they belong to one category or another. The kind of pictures does not make the task easy.

The language exponents are not explicit for the classifying function.

It would be LOTS.

S4: This activity was placed in cell 1A Remember (Identifying) Factual knowledge of specific details.

It does not imply classifying. Students are only asked to remember one of the examples, unless they are explicitly told that they have to think of a plant that has not appeared in the pictures, in which case it would be Recalling.

The language exponents are not explicit.

It is LOTS.
Page 10: T5


Once more, the information provides a revisit of the function of the leaves, to go on with their classification according to their shape and edge. Though, the stress seems to be more on the observation of the different shapes and edges as a way of distinguishing one plant from another, than on the classification in itself.

The language exponents “they are different” and “distinguish” confer explicitness to the comparing function, more than to the classifying one. Only the title “Types of” gives a clue of the classifying function.

Therefore we do not consider the classifying function is explicitly taught.
It is LOTS.
Page 101: \( S_6 \) and \( S_7 \)

\( S_6 \): Activity placed in cell 1A, Remember (Recognizing) Factual knowledge of specific details.

The exponent language “describe” makes the function explicit.

It is LOTS.

\( S_7 \): Activity placed in cell 1A as the previous one, in which they were asked to describe the picture. Now they are given the description and are asked to provide the picture (a graphic answer). Maybe in this case the challenge is bigger, but it draws on the same function.

There are no language exponents, therefore the function is implicit.

It is LOTS.
Page 102: T₆ and S₈

**T₆:** Placed in cell 2B Understand (Explaining) Conceptual knowledge.
There is low explicitness for the Explaining function.
It implies cause and effect, so it is HOTS.

**S₈:** We agreed to place it in cell 2B, Understand (Interpreting: from pictures to words and Explaining) Conceptual knowledge. The activity has been very well designed, because it provides the necessary written and graphic information for the students to understand the process in a participative way (Constructivism).
The students only had to place the word in the correct place, but in doing so they were determining how the parts related to one another and to an overall structure.
The language exponents “look” and “complete the life cycle” confers low explicitness to the function of Interpreting and explaining.
It is HOTS, because students have to interpret the illustration and understand the cycle.
Page 103: S₉, S₁₀, and S₁₁

S₉: Placed in cell 1A Remember (Recalling) Factual knowledge.
The language exponents “circle”, confer explicitness to the function.
It is LOTS.

S₁₀: Activity placed in cell 4B, that is Analyze (Organizing) conceptual knowledge, for
the already mentioned reasons as regards this type of activity.
The language exponents, “order”, confer explicitness to the function.
It is HOTS

S₁₁: Activity placed in cell 2B, that is Understand (Interpreting) Conceptual knowledge
by means of describing the picture sequence.
Explicit language exponent “describe”
It is LOTS.
**Page 104: T7 and S12**

**T7:** This information was placed in cell 3D, that is Apply (Executing) Procedural knowledge of subject-specific skills.

The language exponents give explicitness to the cognitive process of Applying Procedural knowledge.

Although Apply is in the continuum where HOTS could be present, provided the topic and the degree of difficulty of the procedure we have agreed in considering it LOTS.

**S12:** This activity was placed in cell 3D Apply (Executing) Procedural knowledge.

The activity has enough language exponents for each step to keep the function explicit. This Apply Procedural knowledge involves preceding cognitive processes such as Remember and Understand. This is the case in the majority of the cognitive processes, that they normally encompass the lower ones. But the LOTS-HOTS continuum, can suffer “leaps” [e.g. some activities belonging to Understand can be HOTS, while when getting to Apply (Executing), the level of automation reached could call for LOTS] Therefore it was considered LOTS.

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Page 105: $S_{13}$ and $S_{14}$

$S_{13}$: Activity placed in cell 1A Remember Factual knowledge.
It is more an assessment activity than an instructional one.
The language exponents are explicit for the functions covered.
It is LOTS

$S_{14}$: Activity placed in cell 2B Understand (Explaining) Conceptual knowledge.
There are language exponents, “explain”, that make the function explicit.
It is HOTS, because they have to make cause effect inferences and say how it happens.
### THE TAXONOMY TABLE: UNIT 3 PLANTS (SOCIAL AND NATURAL SCIENCES 2 LOOK AND THINK OXFORD, 2010)

<table>
<thead>
<tr>
<th>THE KNOWLEDGE DIMENSION</th>
<th>THE COGNITIVE DIMENSION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. FACTUAL KNOWLEDGE</strong></td>
<td><strong>1. REMEMBER</strong></td>
</tr>
<tr>
<td><strong>Aa. Knowledge of Terminology</strong></td>
<td>1.1 Recognizing (1.3 Recalling)</td>
</tr>
<tr>
<td><strong>Ab. Knowledge of Specific Details and Elements</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>2. UNDERSTAND</strong></td>
</tr>
<tr>
<td></td>
<td>2.1 Interpreting (2.2 Summarizing)</td>
</tr>
<tr>
<td></td>
<td>2.3 Comparing (2.4 Explaining)</td>
</tr>
<tr>
<td></td>
<td><strong>3. APPLY</strong></td>
</tr>
<tr>
<td></td>
<td>3.1 Executing (3.2 Implementing)</td>
</tr>
<tr>
<td></td>
<td><strong>4. ANALYZE</strong></td>
</tr>
<tr>
<td></td>
<td>4.1 Differentiating (4.2 Organizing)</td>
</tr>
<tr>
<td></td>
<td>4.3 Analyzing (4.4 Evaluating)</td>
</tr>
<tr>
<td></td>
<td><strong>5. EVALUATE</strong></td>
</tr>
<tr>
<td></td>
<td>5.1 Checking (5.2 Constructing)</td>
</tr>
<tr>
<td></td>
<td><strong>6. CREATE</strong></td>
</tr>
<tr>
<td></td>
<td>6.1 Generating (6.2 Planning)</td>
</tr>
<tr>
<td></td>
<td>6.3 Constructing</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th><strong>T</strong></th>
<th><strong>S</strong></th>
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<td>S1</td>
<td>S2</td>
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<td>T1</td>
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<td>S13</td>
<td>S14</td>
<td>S15</td>
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<tr>
<td>T5</td>
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</tbody>
</table>

**Table 14:** The Taxonomy Table: Unit 3 Plants  
*(Social and Natural Sciences 2 Look and Think Oxford, 2010)*

**T** = Information provided by the Textbook in written form or by means of labeled pictures  
**S** = Activities that Students are required to do in the textbook

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3.4.4 Unit 3 Plants (Sciences Look and Think 2 Primary Oxford, 2010)

Pages 30, 31: S1, S2, S3 and S4

S1: Placed in cell 1A Remember (Identifying/Recognizing) Factual knowledge of terminology. A few words represent prior knowledge, but there has also been a previous presentation of vocabulary with the concept flashcards and the opening story, the latter in digital format.

There is language exponents “find examples”, so the function is explicit.

It is LOTS.

S2: Placed in cell 1A as well, it activates prior knowledge from Grade 1.

The language exponents is “color” and it makes the identifying function explicit.

It is LOTS.

S3 and S4: Placed in cell 1A Remember (Recognizing) Factual knowledge of terminology.

The language exponents “circle” and “match” make the identifying function explicit.

They are LOTS.
Page 32: T1, S5 and S6

**T1:** Placed in cell 1A Remember (Recognizing) Factual knowledge of specific details and elements.

The language exponents confer a low degree of explicitness to the defining function: ‘what something is and what it does’. However, the title at the top of the page makes explicit the function of Identifying key Factual knowledge specific to the subject, namely “What do plants need to live?”

It belongs to LOTS.

**S5:** Placed in cell 2B Understand (Interpreting, Inferring, Comparing and Explaining) Conceptual knowledge. The placement in this category responds to the fact that students do not only have to Remember Factual knowledge, but to use this knowledge to make inferences and give reasons, by interpreting the pictures and comparing them.

The language exponents “which” and “why” provide explicitness to the functions. It is HOTS.
In line with the previous activity, it was placed in cell 2B Understand (Interpreting, Comparing and Inferring).

There are no language exponents like, for example, “match” to make the Interpreting or Comparing functions explicit. It only says “write the numbers of the plants” where it could have said “match the description with the corresponding picture”.

It is HOTS.

The Teacher’s Guide provides lots of scaffolding questions like the ones in the bubbles along the entire unit.

Page 33: T₂, T₃, and S₇
**T₂**: Placed in cell 1A Remember (Recognizing/Identifying) Factual knowledge of terminology.

The title at the top of the page is the language exponents of the Identifying function that makes it explicit.

It is LOTS.

**T₃**: Placed in cell 2B Understand Conceptual knowledge. It is especially noticeable the explanation of seeds forming inside the flower and fruit forming around the seeds.

The language exponents regarding what something is and what it does is not enough to make the defining function explicit.

It is LOTS, though the explanation about seeds requires some more abstract thinking that could belong to HOTS.

**S₇**: Placed in cell 2A Understand (Interpreting) Factual knowledge, because of the definition of Interpreting, as being able to convert information from one representational form to another, like pictures to words, words to pictures, numbers to words and words to numbers.

No language exponents, therefore the function is implicit.

It is LOTS.
Page 34: T₄, T₅ and S₈

T₄: Placed in cell 2B Understand (Classifying) Conceptual knowledge of classifications. The information provides not only the grouping, but the classifying key. The language exponents “A ____ can be a____, a_____ or a_____, depending on____”, plus the title at the top “What are the different types of plants, confers low explicitness to the function.

It could be LOTS.

T₅: Placed in cell 2B in line with T₄, the information provided deepens in all the details that conform to each category in the classification. The features of each type are well described. This can make it feasible for young students to really distinguish each type. It is of special interest the differentiation of the branches growing high above or near the ground to better understand the difference between a tree and a bush.

The pictures seem clear as well. The scaffolding questions are centered in small bits of descriptive features for the students to provide the type of plant described. This way
they focus their attention and are able to identify the type of plant. And this oral activity is amenable to be used as a game.

Language exponents confer low explicitness to the classifying function. It is LOTS.

$S_8$: Placed in cell 1B Remember (Recognizing) Conceptual knowledge of classifications. It was not considered as $S_8$ belonging to Understand (Interpreting) because the conversion is already provided (pictures and words) and the students only have to make an Identifying activity. There are no language exponents. Therefore, there is no explicitness. It is LOTS.

Page 35: $T_6$, $S_9$, $S_{10}$ and $S_{11}$

$T_6$: Placed in cell 1A Remember (Recognizing) Factual knowledge of specific details and elements. The information provided states that new plants grow from seeds, but
without explaining the process. The rest was likewise considered as a piece of factual knowledge, including the binary classification, which stems from observation. The language exponents are the appropriate for the explicitness of the Remember function. It is LOTS.

S₉: Placed in cell 1A Remember (Recognizing/Identifying) Factual knowledge of specific details, because students have to choose between two short answers “many seeds” or “one seed”.
The activity is preceded by the scaffolding questions, like the one in the speech balloon. The language exponents “write ____ or ____” makes the Identifying function explicit. It is LOTS.

S₁₀: Placed in cell 1A Remember Conceptual knowledge. In the analysis of the Edebé textbook, we placed it in Understand due to the way in which the students had to participate in the construction of the information.
Here, the students are asked to point to each picture in the established order, from 1 to 6, while listening to the sentence that describes what happens in each picture. The language exponents “How” make the function explicit. It is LOTS.

S₁₁: Placed in cell 2B Understand (Interpreting) Conceptual knowledge. The students have to match the description of the life cycle of a plant process with each picture. Though they have already listened to the descriptions in the correct order, they do not only have to Remember by Identifying but to Understand by Interpreting the pictures and relate them to their descriptions. The language exponents “match” make the Understand function explicit. It is LOTS.
Page 36:  T₇, S₁₂ and S₁₃

T₇: Placed in cell 2 B, Understand Conceptual knowledge. Although the information only states the facts, these are in need of an explanation that is provided below by means of the students’ activities.

There are no language exponents of the function in the proper statement, but we find it in the title: “How do plants adapt to their environment? Therefore the Understand thinking skill is explicit.

It is HOTS.

S₁₂: Placed in cell 2B Understand (Interpreting and Explaining) Conceptual knowledge, that is the interrelations among elements within a larger structure, their environment.

The language exponents “tick” and “because” make the functions explicit.

It is HOTS.


The language exponents “observe the experiment”, “circle”, “the plant does this ____ to get_____” is not explicit enough.

It is HOTS.
Page 37: T₈, S₁₄, and S₁₅

T₈: Placed in cell 2A Understand (Explaining) Factual knowledge of specific details and elements.

The exponent language appears in the title “Why are plants essential for life?”

The function is therefore explicit.

It is HOTS.

S₁₄: Placed in cell 1A Remember (Recognizing) Factual knowledge.

The activity responds more to the assessing format of the Recognizing function (True/False), than to an instructional activity.

There is language exponent “which part”, “true or false” that confers explicitness.

It could be considered as LOTS.

S₁₅: This activity was placed in cell 1A Remember (Recognizing) Factual knowledge of specific details and elements.

The language exponents “match” make the function explicit.

It is LOTS.
The title at the top of the page suggests some kind of Metacognitive knowledge not from the Taxonomy perspective, but from awareness of acquired knowledge and self-assessment.

S_{16}: Placed in cell 1 A Remember (Recognizing) Factual knowledge.
There are no language exponents, thus the function is implicit.
It is LOTS.

S_{17}: Placed in cell 1 A as well.
Language exponents “match”, thus the Identifying (Recognizing) function is explicit.
It is LOTS.

S_{18}: As above, placed in cell 1 A.
Language exponents “circle” and the use of different colors make the function explicit.
It is LOTS.
Page 39: S₁₉, S₂₀ and S₂₁

S₁₉: Placed in cell 1A as the previous activities. The language exponents “label” gives explicitness to the function. It is LOTS.

S₂₀: Placed in cell 4B Analyze (Organizing) Conceptual knowledge. Language exponents, “order” make the Organizing function explicit. It is HOTS.

S₂₁: Placed in cell 1A Remember (Recognizing) Factual knowledge. Language exponents “true or false” make the function explicit. It is LOTS.
Page 40: \( T_9, S_{22}, S_{23} \) and \( S_{24} \)

\( T_9 \): Placed in cell 2B Understand Conceptual knowledge by explaining why forests are important for our lives.

There is not, however, any language exponents such as “because”.

Therefore the function is implicit.

It is HOTS.

\( S_{22} \): Placed in cell 2B Understand (Inferring) Conceptual knowledge. There were some doubts among the inter-raters as to place the activity in cell 6 B Create (Generating/Hypothesizing) Conceptual knowledge, which would have to be confirmed by the type of answers given by the students.

The language exponents “What do you think would happen if … and How can you help” makes either of the two functions explicit.

It is HOTS.

\( S_{23} \): Placed in cell 2B Understand (Interpreting and Exemplifying) Conceptual knowledge.
The language exponents “match” make the function explicit. It is LOTS because of the high degree of scaffolding.

S₂₄: Placed in cell 6B Create (Generating/Hypothesizing, Planning and Constructing) Conceptual knowledge. There will be a need of scaffolding and support on the teacher’s part.

There are language exponents that make the functions explicit. It is HOTS.

**Page 41: S₂₅**

S₂₅: Placed in cell 6C Create (Planning and Constructing) Factual, Conceptual and Procedural knowledge. The product belongs to Factual knowledge and the procedures followed to develop that product to Procedural knowledge, provided in this case by the textbook.

There are language exponents that make the functions explicit. However, it would be very helpful to use the words “classify” or “classification”.

It is HOTS.
4. FINDINGS AND DISCUSSION

This chapter is aimed firstly at providing a general overview of the findings in each of the textbooks analyzed, beyond the specific observations that followed the analysis of the information and activities in the Analysis section, and secondly to offer an overall comparison of the findings in the four textbooks.

In order to discuss the findings within a clearer perspective four tables containing the instances of implicit and explicit functions along with the instances of LOTS and HOTS will be provided. In addition, four bar graphics containing the distribution of the Ts and Ss, within the cognitive categories and the knowledge dimensions for each textbook will allow for a clearer comparative picture.

4.1 Findings and discussion in Oxford (2005)

The content information (T) is balanced with the students’ activities (S) in terms of quantity, which represents a balanced teacher-student centered approach.

The S activities tend to demand less than the T provides: Half of the content information T, is placed in Remember Factual and Conceptual knowledge (first step in the low-high order continuum). The other half in Understand Factual and Conceptual knowledge (second step in the low-high order continuum) In contrast, students’ activities S are mostly placed in Remember Factual knowledge (first step); only one activity in Understand Conceptual knowledge (second step); and two activities in Apply Factual knowledge (third step). The conclusion is that the S activities have been placed mostly in the lower level, a finding which reflects the publisher’s belief that young students are not able to cope with more challenging cognitive activities.

There has been found misalignment between T₃ and S₃, the information belonging to Remember Conceptual knowledge and the activity to Remember Factual knowledge. Thus, while T₃ offers the definition and functions of three parts of a plant, in S₃, the students only have to label these parts. (see p. 45)
As shown in Table 1 below, there are six instances of information provided by the textbook (T) and ten instances of activities for the students to do (S). The S activities were numbered from 1 to 10.

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**Table 15**: Instances of implicit, explicit, low order and high order functions in Oxford (2005)

Five of the Ts show a low degree of explicitness while the sixth one is explicit.

Three out of the ten S are implicit; two have a low degree of explicitness and the five remaining are explicit. That makes a total of three implicit instances out of sixteen.

The instances with a low degree of explicitness or without any explicitness correspond in the most part to the defining and classifying functions. In other words, the textbook does not explicitly use the language exponents ‘define’ and ‘classify’. It would be convenient for young learners to become acquainted with the terms ‘define’ and ‘classify’.

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Of the six instances corresponding to T, only one of them, T₆, belongs to HOTS. Accordingly the two corresponding activities (S₆a and S₆b), belong to HOTS as well. There are instances of lost opportunities to have developed HOTS, as in S₁₀, or to have developed other forms of HOTS as in S₆b with one follow-up question such as ‘Why are plants important?’

4.2 Findings and discussion in Anaya (2007)

The most outstanding feature is the great deal of information (T) provided by the textbook, (textbook-centered approach). All this information belongs to LOTS whereas half of the students’ activities (S) belong to HOTS. Therefore, there is no alignment between the information provided and the activities required. The information provided is vast, and presented all at once without any gradual development or any scaffolding. In fact, the language exponents of all the book headings preceding each piece of information are: Listen, read and learn. The conclusion is that the S activities have been placed in a higher level than the provided information, without gradual development, a finding which reflects misalignment and rote-learning.

Apparently, there is variety of activities in terms of the functions activated, but the activities are not consistent with the objectives of the textbook information. Misalignment is a general feature of this textbook:

1. Even, when there are four Ss and two Ts coinciding in the same cell (1A Remember Factual knowledge), only one of the activities, S₄, is aligned with its corresponding T₄.

2. In the case of S₁, its topic is vital functions of plants but the corresponding T₁ does not deal with that topic. Thus, though both T₁ and S₁ fall in the Remember Factual knowledge cell, the learning outcomes are not aligned.

3. S₂ has some alignment with T₁ in that T₁ presents the names of four plants, and in S₂, students are asked to match four names of plants with their corresponding pictures, but only one of these appears in T₁.

4. Another misalignment example is S₃ where students have to sequence pictures of the cycle life of a plant, without the corresponding information (T) provided.
5. Activity $S_5$, corresponding to information $T_2$ is another instance of misalignment since the activity belongs to cell 1A Remember (Recognizing) Factual knowledge and the information $T_2$ was placed in cell 2B Understand Conceptual knowledge. The cognitive category Understand involves the construct of meaning from instructional messages. The way in which the instructional message is delivered, made us think of rote learning with no transfer promotion. Therefore it is LOTS, when it would require higher order thinking skills HOTS, to really achieve a meaningful learning outcome. (see $T_2$ p.55 and $S_5$ p.57)

6. Activity ($S_6$) that is as well in the Evaluate cognitive category has an assessment format, but does not cover any general assessment of the Unit. It appears as an isolated instance.

7. Activity ($S_8$) in the Meta-cognitive Knowledge dimension in the form of self-knowledge: this kind of ‘can do’ statement activities needs a great degree of accuracy and self-awareness on young learners’ part. The kind of teaching approach followed by the textbook does not seem to be adequate to develop this kind of knowledge.

   Activities implying a more general kind of self-knowledge, like those with a self-assessment of the type of: My work was O.K. / Good / Excellent, are good activities for initiating young learners in self-knowledge. They usually learn to assess themselves properly, after guided feed-back on their answers in the first units.

As can be seen in Table 2 below, there are five instances of information provided by the textbook (T) and eight instances of activities for students to do (S). Most of the functions are explicit, except for two T instances which are implicit and correspond to the academic functions of ‘identifying’, ‘describing’ and ‘defining’ and ‘explaining’. The two T instances with low explicitness correspond to the “identifying and “classifying” functions. As already mentioned, defining is a function worth to be explicitly taught, and the same can be said of explaining and describing. These terms may be very well understood by young learners.
Table 16: Instances of implicit, explicit, low order and high order functions in Anaya (2007)

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<th>IMPLICIT</th>
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<td>T₁ identifying</td>
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<td>T₂ defining, describing, explaining</td>
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<td>T₃ low (classifying)</td>
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</table>

4.3 Findings and discussion in Edebé (2007)

The most outstanding feature in this textbook is its student-centered approach with good scaffolding strategies; meaningful learning and especially adequate co-construction of knowledge (*see S₂ p. 63 and S₈ p. 69*). It also has a very good alignment as can be seen in the Taxonomy Table, where the Ts and Ss occupy the same cells. Ts and Ss are well distributed between Remember and Understand cognitive categories.

The textbook provides many instances with less amount of information and more instances of scaffolding.

As shown in Table 3 below, the S activities double the Ts in number, a finding which implies that the textbook follows a student-centered approach. The Ts fall in their majority under the LOTS; however a well-designed scaffolding pattern enables the students to cope with some activities belonging to HOTS. Moreover, information from preceding Ts (such as parts of the plant and their function) is revisited in subsequent Ts.
As regards the explicitness, most of the functions activated by the Ts and Ss are explicitly taught. However, again, in this textbook ‘defining’, ‘classifying’ and ‘explaining’ are the functions less explicitly taught. Although it may be a difficult task for this age, it could be worth it to introduce the terms ‘defining’, ‘classifying’ and ‘explaining’, explicitly in the curriculum. For instance in S2, a well-designed activity, the defining function could go further with some extra writing. Perhaps in another session in which the children would reformulate the partial definitions into complete ones. A good activity to deepen the notion of definition would be to ask the children to write the definitions of each part as follows, e.g.:

Definition of fruit:

Fruit is the part of the plant that has seeds inside.

It should be mentioned that in T3 and S3, dealing with types of roots, there are some misconceptions between roots and stems (see p. 65) and there is, as well, a lost opportunity to introduce the topic of edible parts of the plants and the topic of importance of plants to life.

The activation of Apply (Executing) function is made in conjunction with some phases of the scientific method (observing and reporting).

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| S1 defining | S1 | S1 |
| S2 classifying | S2 |
| S3 recalling | S3 |
| S4 identifying | S4 |
| S5 identifying | S5 |
| S6 identifying | S6 |
| S7 identifying | S7 |
| S8 identifying | S8 |
| S9 identifying | S9 |
| S10 identifying | S10 |
| S11 identifying | S11 |
| S12 identifying | S12 |
| S13 identifying | S13 |
| S14 identifying | S14 |

Table 17: Instances of implicit, explicit, low order and high order functions in Edebé (2007)
The unit finishes with an easy assessment activity and a more complex activity in which students are explicitly asked to explain how a new plant is born.

4.4 Findings and discussion in Oxford Look and Think (2010)

This textbook guides learners from T information belonging to Remember Factual knowledge to very well designed activities in which students construct meaning going beyond Remember to Understand with several subcategories activated at a time (Interpreting, Inferring, comparing, Explaining). In summary, this textbook scaffolds and makes use of a broader range of the subcategories in each category of thinking skills. There is only one activity $S_{15}$ (see p. 82) in need of some scaffolding to provide a procedural rule for the students to get to the correct answer. That is, get them to find the easiest matching in the first place, namely flowers with perfume. For bark and cork, it would be advisable that they have had the previous opportunity to observe the bark in a tree and a piece of cork. For resin and ink, being the observation procedure less available, we suggest using the Internet. Doing this activity without these previous activities will end up in rote learning.

Unlike the previous books analyzed, this volume offers more coverage of plants topics such as adaptation to their environment and plants as essential for life. Interestingly, it is the only textbook, among the studied ones, that includes activities in Create cognitive category, in its subcategories of Planning and Constructing and one activity, potentially belonging to the Hypothesizing subcategory. There is another salient feature in this book and that is the use of Wh-questions, (low order and high order ones)\textsuperscript{18} in the titles of each lesson, indicating by means of their language exponents the functions that are going to be activated.

As can be seen in Table 4 below, most of the Ts and Ss are explicit. However, again, as in all the other textbooks analyzed, there is no explicit use of the terms “define” and “classify”. The proportion of Ts and Ss belonging to LOTS and HOTS is very similar and shows good scaffolding, which has already been observed in the Analysis section.

\textsuperscript{18} What, who, which, when, where are considered to represent low order thinking skills whereas How, Why, What would/if… represent high order thinking skills. (Bentley, 2010 at NILE training course).
The number of Ss almost triplicates the number of Ts which is an indicator of a student-centered approach, provided that the Ts represent short and balanced information. There are four S activities before the first T information which reinforces the idea of a student-centered approach along with the huge number of S activities (25).

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Table 18: Instances of implicit, explicit, low order and high order functions in Oxford Look and Think (2010)

Finally, all these facts, plus the activating of prior knowledge in conjunction with a continuous use of scaffolding strategies, represent not only a student-centered approach, but a strong belief in young children’s capacities.
4.5 The four textbooks compared

The main findings in the four textbooks analyzed are presented in Table 5 below.

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<tr>
<td>• Textbook-student centered approach.</td>
<td>• Textbook-centered approach.</td>
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<tr>
<td>• T information and S activities well balanced in quantitative terms.</td>
<td>• Huge deal of information without transfer promotion and a lack of corresponding activities.</td>
</tr>
<tr>
<td>• One instance of misalignment.</td>
<td>• General misalignment.</td>
</tr>
<tr>
<td>• Two instances of lost opportunities to have developed HOTS.</td>
<td>• Three instances of activities belonging to HOTS with insufficient support.</td>
</tr>
<tr>
<td>• S activities less demanding than T information provided.</td>
<td>• S activities more demanding than the T information provided.</td>
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<tbody>
<tr>
<td>• Student-centered approach.</td>
<td>• Student-centered approach.</td>
</tr>
<tr>
<td>• Many instances of scaffolding and co-constructivist approach in the T information as well as in the S activities.</td>
<td>• Huge number of S activities with great use of scaffolding patterns.</td>
</tr>
<tr>
<td>• No misalignment instances.</td>
<td>• No misalignment instances.</td>
</tr>
<tr>
<td>• Activities belonging to HOTS have a well-designed scaffolding pattern.</td>
<td>• More instances of activities belonging to HOTS.</td>
</tr>
<tr>
<td>• S activities and T information are balanced in qualitative terms: the demands are equated.</td>
<td>• S activities and T information are balanced in qualitative terms: the demands are equated.</td>
</tr>
</tbody>
</table>

Table 19: Main findings in the four textbooks analyzed

In the four textbooks the “defining” and “classifying” functions appear implicitly or with low explicitness.

In the four graphics below it can be seen a distribution of the Ts and Ss of the four textbooks, for clarifying purposes. The bars of the Ts and Ss corresponding to the same Knowledge dimension are the same color (light and dark respectively) in all the Graphics to facilitate the comparison.
Oxford (2005) covers the first four cognitive functions and only Factual and Conceptual knowledge. Note that there are no instances of Ss activities in Conceptual knowledge of any cognitive category, (except Analyze, but this one is common to all the textbooks).
Anaya (2007) covers the first four cognitive functions and the four types of knowledge. Note that there are no instances of Ss activities in Conceptual knowledge of any cognitive category, (except Analyze, which is common to all the textbooks). There are two S activities and one T in Procedural knowledge (Apply); and one S in Meta-cognitive knowledge (Remember).
Edebé (2007) covers the first four cognitive categories and Factual and Conceptual knowledge, plus Procedural and Meta-cognitive knowledge. Note that in this textbook there are five instances of S activities of Conceptual knowledge in Understand; and one S with its corresponding T in Procedural knowledge in Apply.
Oxford (2010) covers the first four cognitive categories (except Apply), with 12 instances of S activities in Factual knowledge and 10 instances of S activities in Conceptual knowledge. In the sixth category Create there are four S activities instances of Factual, Conceptual and Procedural knowledge.

As can be seen, all textbooks have one S activity in Analyze Conceptual knowledge. In general, the categories most activated correspond to Remember and Understand.

Procedural and Meta-cognitive knowledge are as well in need of further implementation.

All in all, the coverage of all cognitive categories and all types of knowledge has to fulfill pedagogical requirements such as meaningful learning, good alignment, and scaffolding strategies.
5. CONCLUSIONS AND IMPLICATIONS

This study has attempted to investigate whether science textbooks in Primary CLIL classrooms could be a good means to explicitly teach thinking and academic language skills to young learners, analyzing these thinking and academic skills under Bloom’s Revised Taxonomy as the instrument of analysis. A special interest was placed in that the teaching of thinking skills need not be restricted to the low order thinking skills, but on the contrary might be expanded to the teaching of high order thinking skills from the first years of the teaching learning process. In addition, this study was centered in highlighting the need and the relevance of addressing this kind of cognitive stimulation to underprivileged learners.

The results led us to the following conclusions regarding the proposed research questions:

1. The types of thinking skills activated in these textbooks fall mainly in the cognitive category of Remember Factual knowledge, followed by the categories Understand Factual and Conceptual knowledge. Thus, in general, the thinking skills activated are placed mainly in the lower category.

2. The thinking skills are in general explicitly taught. However, the “defining”, “classifying” and even “explaining” are the ones that appear implicit in more instances. And, when there are language exponents that state them, they are not explicit and clearly named: “define”, “classify” or “explain”, which would be very useful for young learners to become acquainted with the subject academic language and for their cognitive development.

3. The predominating level of thinking skills is LOTS. However, the last textbook, Oxford 2010, shows a raise in higher order thinking skills.

The findings have led to the conclusion that along the few last years of CLIL implementation in the Autonomous Community of Madrid, there has been a growing interest and effort of the publishers to improve CLIL textbooks. This gradual shift in textbook design is beginning to provide answers to some of the teachers’ needs.
However, this in itself will not be sufficient. Teachers may be partially relieved of the load of constructing their own materials, a task for which they may have not been especially trained (see Clegg, 2007), but in order to take advantage of a well-designed textbook, teachers need to be trained in recognizing the textbooks’ strengths and weaknesses and teachers should also have an in-depth knowledge of how to develop and foster the thinking skills and cognitive self-awareness in their young learners. For instance, the same textbook promoting thinking skills can be used in many different ways leading to an achievement that goes beyond the textbook. And this, ultimately, depends on the teacher’s beliefs, knowledge, attitudes and capability of implementing further activities from the ones provided in the textbooks.

One more point for future consideration is that of well designed CLIL Science textbooks having parallel textbooks for L1 instruction. One of the analyzed textbooks fostered few high order thinking skills, was primarily based on rote-learning and had a considerable deal of misalignment instances. This textbook is a translation from the ‘Conocimiento del Medio 2 Salta a la vista’, a textbook which has been used for four years in our school.

In my view, Cummins’ Interdependence Hypothesis across languages might well be translated into an Interdependence Hypothesis across CLIL settings and L1 subjects learning. If underlying learning theories and methodologies in CLIL, such as constructivism, scaffolding provided by teachers as well as by expert-peers, collaborative learning, hands-on activities, activating of prior knowledge and promoting of thinking and academic language skills, were transferred to L1 subjects in Primary schools, it could possibly result in exponential benefits in both CLIL and L1 development. Backing on 32 years of experience in teaching English, Spanish Language and Conocimiento del Medio, under the different educational laws that have been implemented by the educational authorities, the author of the present study believes that L1 instruction in Spain is in need of creating a parallel model with CLIL underlying methodologies.
5.1 Restrictions and pedagogical implications

In terms of limitations, a reduced range of textbooks (i.e. four textbooks) have been analyzed, given the vast offer of published material available. Nevertheless the selected units have been analyzed in depth. Along the analysis, some doubts emerged amongst the inter-raters which remain open for further research. The present study has analyzed textbooks published within the last five years. It would be interesting to undertake further research of textbooks published from now on.

As regards the main findings and their related pedagogical implications, it could be claimed that:

1. Some activities could have gone further by asking the students to Apply (Executing) an experiment and predict what would happen, then record it (scientific method), (see p. 81)

2. Publishers, as well as teachers, should be aware of any misalignment, (see p. 33 and p. 89), provided that it will cause inconsistencies and it will be an impediment to the consecution of the intended outcomes. Moreover, publishers should be aware of the need of team-collaborative design of Science CLIL textbooks along with English CLIL textbooks.

3. Although it may be a difficult task for this age, it could be worth it to introduce the terms ‘defining’, ‘classifying’ and ‘explaining’, explicitly in the curriculum.

4. More functions belonging to HOTS could have been activated with an extra follow-up question, such as: Why? The use of higher order ‘Wh-questions’ (e.g. ‘how’, ‘why’, ‘what if’ addressed to young students can scaffold the learners’ learning process from lower to higher order thinking.

5. Though the categories most activated correspond to Remember and Understand, it seems possible to expand to the upper categories, especially to Apply, Evaluate and Create.

6. Procedural and Meta-cognitive knowledge are as well in need of further implementation.

There is a need to place high expectations on learners. Even young learners are capable of more than is usually believed. ‘Whatever stages you may postulate, you can devise situations for testing young infants (…) that can easily bring the infants to a level way
beyond where they are supposed to be developmentally’ (Bruner, 1985b in Chipman et al. ibid.: 600).

During the first year of the CLIL program implementation in our school, the outcomes of less able learners have been better in the CLIL subjects than in L1 subjects, including that of language. Halbach (2009) reports similar findings made by many teachers and states that the methodology employed could be an important factor. As Chipman et al (ibid.: 5) maintain, the ‘development of higher cognitive skills that enable students to be independent learners has always been a very important goal for educators(...) Furthermore, there is a reason to believe that improved instruction in such skills might help to overcome persistent socio-economic and cultural differences in the outcomes of education.’

Peer collaboration is crucial both in L1 instruction and in CLIL. Apart from the promoting of collaborative and non-competitive attitudes, not only is there a benefit for the less able learner, who in many occasions finds it easier to understand a peer than the teacher, but to the expert peer, there is an added value: he or she benefits from a deepening in his own knowledge and cognition and of a developing of metacognition to be able to engage in the process of guiding a novice peer. Of course, in the case of young learners, this process of peer-scaffolding should be guided and supervised by the teacher, but once the children become used to it, and provided they use well-designed materials and textbooks, even the younger learners gradually become good at it. Both, the expert-peer and the novice-peer will be able to experience an inner rewarding feeling of responsibility and social-cooperation leading to the co-construction of knowledge and the achievement of higher degrees of self-awareness and development in the cognitive and affective domains.

All in all, the author of this study believes in the great potential influence that teachers and publishers may have to improve the quality of our educational system. As Anderson and Krathwohl (2001: xxiii) state:

Our final audience is the authors and publishers of the textbooks that elementary and secondary teachers use to teach their students. These authors and publishers have the greatest potential for influencing both teachers and students if, as many have in the past, they incorporate our framework in their texts and show how it can be used to help teachers analyze their objectives, instruction, and assessments and determine the alignment of the three.
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