CLIL in Catalonia: Learning through talk and interaction in secondary science classrooms

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Abstract

This mixed-methods study concerns the teaching of CLIL to students in mainstream secondary schools in Catalonia. English proficiency levels among school students remain persistently low throughout Spain compared to other European countries, despite policies to lower the age at which pupils start to learn English and increase the time they spend in lessons. Given the limited space in the curriculum in Catalonia, which already has the challenge of teaching two official languages, CLIL has increasingly been viewed as a solution to bolster English competence. This study therefore sets out to explore interaction and discourse in CLIL and L1 secondary science classrooms to find out how teachers were able to achieve their CLIL learning aims, while comparing teaching strategies and pupil participation in CLIL and L1 learning environments.

Qualitative methods (questionnaires and interviews) were used to measure student and teacher perceptions of CLIL, while a combination of qualitative and quantitative measures were employed to analyse transcripts from 20 hours of recorded lessons.

The results show that teachers used a greater range of tasks in the CLIL lessons to scaffold learning, engage students and encourage participation. Learning was more visual and hands on in the CLIL classrooms, whereas in the L1 lessons it could feature long stretches of teacher talk with few student-centred activities. However, student participation was low in the CLIL lessons. Students struggled to ask and answer questions in English, and teachers were unable, and often reluctant, to employ strategies to get students speaking, for example, through the use of ELT-style speaking activities. The research also revealed high rates of L1 use, both to communicate within the CLIL lessons and to teach entire lessons on the course. This reflects the teachers' view that the science took precedence over language learning and that their aim was to teach the same amount and depth of science content in the CLIL lessons as they would expect to teach when using students' L1.

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Glossary of Spanish terminology

Concertada: semi-private school in Spain.

ESO (*Educación Secundaria Obligatoria*): Compulsory secondary education for students between the ages of 12 and 16.

Bachillerato: Two-year academic course (comparable to A Levels) for students between the ages of 16 and 18.

Funcionario: Civil servant

Oposiciones: Civil service exams

Enchufado: System of favours to help friends and contacts get jobs, obtain contracts, secure loans, etc.

Extraescolar: Activities that take place outside of school hours, but often on school premises, for example, English lessons.

Selectividad: University entrance exam

Sociales: Social sciences studied at school. The subjects of history and geography are usually taught as one course by the same teacher.

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Chapter 1. Introduction

1.1 Rationale

This thesis is about CLIL (Content and Language Integrated Learning) in Catalonia. It focuses on two secondary schools, in which science was taught in English to 2nd and 3rd year students from a wide variety of backgrounds. My research is based on the transcripts of the lessons I recorded, together with questionnaires and interviews with teachers and pupils.

My interest in CLIL stemmed from my work as an English language teacher in Barcelona. There are hundreds of private language academies across Spain teaching students as young as three to mature students in their sixties and seventies. Everyone, it seemed, was learning English. However, English levels in Spain remain among the lowest in Europe. In the most recent European Barometer survey (European Commission, 2012), Spain came 23rd out of 28 countries. 54% of Spanish citizens admitted they could not speak a language other than their mother tongue, while 18% claimed they could hold a conversation in two other languages.

I moved to Barcelona from the UK in 2001 and had been working as an English teacher since then, teaching young learners in private academies and in after school (*extraescolar*) English programmes. Like many English teachers, I was struck by the unfairness of the education system, particularly in regard to learning English. The secondary school pupils I taught in *extraescolar* classes rarely had English levels higher than A2, despite studying 3 hours a week in school and another 3 hours a week in extracurricular lessons. This could prove a problem for them in the future, since from 2019, university students in Catalonia will need a B2 level of English to graduate from university. Learning English well enough to embark on a professional career, therefore, seemed an unlikely prospect for many young people, and something they could only hope for if their parents could afford the 1000 euros a year needed for private English classes.

When I first heard about CLIL, I thought it could be an effective way to boost English levels among school pupils and create greater equality between them. However, I was concerned about how it would work, bearing in mind students' low competence in English. The school where I was teaching had begun a CLIL project in geography and my *extraescolar* pupils told me that their CLIL lessons mostly consisted of teachers lecturing in English, and that they were struggling to keep up.

The original aim of this project, therefore, was to find out how teachers were able to achieve their content objectives, given the existing levels of English, and compare teaching strategies and pupil participation in CLIL and L1 learning environments.

1.2 Education in Catalonia and Spain

The 2012 PISA (Programme for International Student Assessment) survey, which compared 34 OECD member countries and 31 partner countries, showed Spanish 15-year-olds were below average in the key skills of mathematics, reading and science. This was despite a 35% increase in education spending in Spain since 2003. The PISA study highlighted some key differences between the Spanish education system and those in OECD countries with better results. Schools in Spain have less autonomy over the content they teach, there is less focus on teachers' professional development, and teachers in Spain are much less likely to receive mentoring and appraisals (46% compared with a 73% average) than in other OECD countries. There is also little national benchmarking of results, which means it is difficult to measure teaching performance. The 2012 PISA survey found that 44% of students in Spain attend schools that benchmark their performance regionally or nationally (compared with a 62% OECD average).

Teachers who come to Spain from other countries are often struck by the old-fashioned teaching methods employed in 21st century Spanish schools, compared to the constructivist-influenced classrooms of North America or the UK. While teaching training is improving, with newly qualified teachers now obliged to complete a one-year PGCE (Post Graduate Certificate of Education)-style course in addition to civil servant exams, content subjects are still largely taught in an instructive way, with frequent tests to check on students' progress. This focus on learning facts to pass exams creates a stressful environment for pupils, reflected in the highest drop out rate for secondary school students in the European Union: 23.5% compared with an 11.9% average (Eurostat, 2014).

Students are first introduced to English at the age of three, and continue to learn it throughout their school careers, studying three hours a week. English teaching in primary and secondary schools in Catalonia is based on the communicative approach, often using books created by UK-based publishers such as Macmillan, Oxford and Cambridge. However, the number of students per classroom is usually around 25-30, and secondary school students invariably sit in rows, which can limit the potential for student-to-student interaction. It is common for teachers to use L1 to maintain discipline and explain ideas, and at the same time prefer students to work quietly on their own. As a result, many students leave school having passed their English exams but with limited speaking skills.

The PISA study also highlighted the problem of inequality among Spanish school pupils, noting that over 85% of performance differences in mathematics could be accounted for by socio-economic differences. This is compared with 47% of difference in Italy and 16% in Canada. This issue of inequality was also noted by Hernández Sierra (2006), writing about her experience as a secondary school teacher in Barcelona. She observed that competence in English, more than competence in science, was a reflection of social background.

1.2.1 CLIL policy in Catalonia

The Catalan Department of Education has been committed to CLIL since the introduction of the Orator Project in 1999, a five-year action plan designed to improve foreign language teaching, of which CLIL was one of the innovations promoted for secondary education (*Centre de Recursos de Llengües Estrangeres*, 2006). Funding was made available for subject teachers with a high command of the target language to take paid leave and do a three-month course on CLIL methods at the University of Nottingham. At the same time, native-English speakers were recruited via the British Council to work as in-school language assistants alongside content teachers. CLIL training is now organised by the ‘Train the CLIL Trainer programme’, which began in 2008, and is composed of 20 expert CLIL teachers from primary and secondary education.

In addition to officially sanctioned and financially supported projects, many other CLIL courses have begun at grassroots level, led by enthusiastic content teachers, some of whom have participated in short training courses, run by the Department of Education or private organisations such as Macmillan. While much of the funding has dried up since the onset of the economic crisis, the enthusiasm for CLIL remains.

Catalonia's status as a plurilingual society may help explain why CLIL has been embraced so wholeheartedly. CLIL programmes are common in many other plurilingual European regions such as the Basque Country, Ireland, Luxembourg and Wales, and Marsh (2002) suggests that this could be due to pressures on school timetables. Adopting CLIL means that instead of devoting three hours to English and three hours to science, schools can opt for three hours of science in English. In practice, though, in Catalonia, students continue to study three hours of English language, and any CLIL lessons are on top of this requirement. Canadian immersion research, which I look at in more detail in chapter 2, found that specific language lessons were still needed, even in immersion contexts. For example, Genesee (1994: 4) found that, 'A systematic focus on the structural aspects of the language greatly enhances learning of targeted grammatical features'.

The number of schools offering CLIL programmes in Catalonia has grown rapidly in recent years. According to a 2014 Department of Education report (*Generalitat de Catalunya*) on the use of other languages as a vehicle for learning, 47.1% of Catalonia's 2,378 primary schools (42% of public and 60.9% of private) were offering CLIL in English in 2013-2014. This figure has increased from 38.3% for the 2012-2013 school year. The proportion of secondary schools is slightly lower, with 33% of 1,247 secondary schools (29.6% of public and 36.4% of private) offering CLIL in English in 2013-14 up from 27% of schools in 2012-2013.

Despite these promising figures, it is likely that many of these schools are offering a limited CLIL offering to a handful of pupils. Navés and Victori write that, 'In Catalonia we still have to talk about isolated CLIL experiences involving schools that offer a CLIL course or two or part of one or two courses during primary or secondary education, rarely involving a continuity from one educational level to the next.' (2010: 33).

1.3 CLIL policy in the EU

Given the need to create multilingual citizens and encourage cross cultural understanding, the EU's education policy is unsurprisingly pro-language learning. The focus on improving language skills, in particular English, in the mid-1990s coincided with the emergence of CLIL as a methodology and a growing acceptance of the limitations of traditional language teaching (Dalton-Puffer, 2011).

CLIL has been promoted enthusiastically by the EU and has featured in policy declarations in 1995, 2003 and 2008. As in Catalonia, the impetus from policy makers above has been matched by the enthusiastic efforts of teachers at grassroots level, who have often led the way in initiating CLIL projects (Lasagabaster and Ruiz de Zarobe, 2010), particularly in countries where government money has not been forthcoming. Spain and the Netherlands have been unusual in that governments have invested heavily in CLIL implementation. However, in Spain, this was focused in Madrid and the Basque Country, which set up bilingual schools. In other regions, including Catalonia, funding came mainly in the form of teacher training.

Catalonia, then, is in many ways more similar to other European countries, like Germany or Finland, in the way that CLIL projects have been led by a grassroots rather than national impetus.

1.4 Research questions

As I will detail in chapter 3, my study took the form of three stages. In the initial study, I taught a three-month geography course to secondary students in Barcelona. It was my first experience teaching CLIL and a relatively new experience for the students as well. As a consequence, I asked broad questions about how students had adapted to the course, how well they had been able to learn the content and whether their English levels had improved as a result.

In the main study, I was a participant observer in two secondary schools where students were learning science in both their L1, Catalan, and English. This time, I was more interested in the learning processes than the outcomes, particularly how they differed between the two languages of instruction. My research questions for this stage were as follows:

1. How was the spoken interaction in the L1 and the CLIL lessons different? Was one lesson type more monologic or dialogic?
2. What strategies did teachers use to scaffold learning in the CLIL lessons? How did learners benefit from these strategies.
3. What methods did teachers employ to overcome problems of understanding without using L1?

Finally, in the follow-up study, I returned to one of the schools from the main study. I wanted to find out how the teacher's CLIL practice had developed and also ask the students, now studying at *bachillerato*, about their attitudes to learning science and English.

1.5 Organisation of the thesis

In the introductory chapter, I present the rationale behind this study and give an overview of CLIL in Catalonia. This is followed by the literature review, in which I present a review of the developments in education that led to CLIL. I then look at science learning theory, before setting out a description of CLIL methodology and discussing research into CLIL classrooms in recent years. Chapter 3 sets out the research questions and also the research design of this study. It introduces the methods and data analysis procedures used. Chapter 4 presents the results of the initial study and shows how it shaped the questions and the design of the main study. In chapters 5 and 6, I present and discuss the results of the main study regarding the analysis of classroom transcripts. Chapter 7 is a presentation and discussion of the participating students' and teachers' views on the CLIL courses that comprised the main study. Chapter 8 concludes the thesis by summarising the results of the study and describing its contributions. I make suggestions on how CLIL practice can develop and discuss the limitations of the research and the areas that could be the focus of future research.

Chapter 2. Literature review

2.1 Origins of CLIL

Many of the central ideas and methods advocated in CLIL can be traced back directly to constructivist beliefs on cognition, scaffolding, communication and what the role of the teacher should be.

Coyle, Hood and Marsh (2010) set out a model of CLIL, which bases itself firmly on socio-cultural, social-constructivist perspectives. They stress the need to seek out 'effective pedagogies in different contexts' (2010: 28), rejecting the traditional transmission models of teaching in favour of a more interactive and student-led approach. Pointing to Vygotsky's Zone of Proximal Development (1978), they emphasise the importance of a learning environment, in which students are always challenged, but with sufficient guidance and support to fulfil their potential. This shift from transmission style classrooms implies a new role for the teacher, from instructor to facilitator with a gradual reduction in support as learners become more autonomous. Coyle et al's model (2010) is also indebted to immersion and bilingual education as preceding movements, which through the 1970s and 80s evolved to give content equal status alongside language (Mohan and Van Naerssen, 1997)

In the following pages, I will look at how both social-constructivist perspectives and the lessons of Canadian immersion programmes shaped current CLIL methodology.

2.1.1 Socio-cultural, socio-constructivist perspectives on learning

The work of the constructivists, Bruner (b.1915), Piaget (1896-1980) and Vygotsky (1896-1934), led to a transformation from didactic, teacher-centred approaches to the learner-centred classrooms that we find in much of the world today.

The constructivists called into question the memorising of facts as a way of learning. Piaget's model of development (1923) illustrates how human knowledge develops cyclically. When a child performs an action that affects an object, the child observes the characteristics of that action and its effects. By repeating these actions in different ways and in different contexts, the child develops understanding of the objects and his or her actions in a process of 'reflective abstraction'. Meanwhile, the child is able to recognise the properties of the objects based on the way different actions affect them in a process of 'empirical abstraction' (Piaget, 1923).

Continuing the discussion on fact learning, Bruner points out that 'unless detail is placed into a structured pattern, it is rapidly forgotten' (1960: 24), but when learners are able to understand the main principles that knowledge is built on, they can create and recreate these facts. This is preferable to trying to memorise them, since 'knowing how something is put together is worth a thousand facts about it.' (Bruner, 1983: 183). Bruner believed that parents naturally scaffold for their children, reminding them of what they already know to give them a framework in which to learn new things. He recommended teachers adopt a similar strategy to provide students with the ideal conditions for learning and encourage them to become independent learners. 'As a teacher, you do not wait for readiness to happen; you foster or "scaffold" it by deepening the child's powers at the stage where you find him or her now' (Bruner, 1996: 120). When used effectively, scaffolding helps learners develop schemata and adopt knowledge from both people and the environment. Hence, the educator's role is to develop students' conceptual knowledge by managing the content of learning activities. In Bruner's work on the Spiral Curriculum (1960), he promotes the idea of revisiting the same content in different ways depending on students' developmental levels. As a result, a child's level of understanding is deepened each time they revisit an idea, remembering what they already know, and building on this understanding with something new each time. Through this sequential development of a child's cognitive abilities, and the mental processes that occur when they recognise, recall, analyse and understand ideas, synapses and synaptic connections in the brain are strengthened. This in turn reinforces and solidifies knowledge and understanding.

Leading on from the view that students should revisit the same content in a variety of ways, the constructivists advocated a dynamic and active approach to learning, where learners explore ideas, test out solutions and engage in a variety of tasks. Students should be involved in the learning process rather than passively listen to teachers explaining ideas. Education, therefore, needs to be 'participatory, proactive, communal, collaborative, and given over to constructing meanings rather than receiving them' (Bruner, 1996: 84). Moreover, classrooms should be playful, since through play, the child develops abstract meaning separate from the objects in the world, which is a critical feature in the development of higher mental functions (Vygotsky, 1978). Bruner wrote, 'I have long been convinced that play and "playfulness" free us from the narrowing immediacy of pressing demands, enabling us better to explore the combinatorial possibilities that are opened to us by our cognitive powers' (Bruner, 2006: 5).

The role of interaction and communication is also important in a constructivist view of learning, and children are thought to develop best in a classroom with interaction. Interaction in groups helps develop a child's ideas and skills. In addition, children can learn from each other as they each bring their own knowledge, experiences and opinions to the table. Vygotsky thought social interaction played a fundamental role in cognitive development, and children learn first as part of a group, and later as an individual. ‘Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first, between people (interpsychological) and then inside the child (intrapsychological)’ (Vygotsky, 1978). The role of the teacher in a constructivist classroom, then, is less instructor, and more facilitator. Teachers must know their students and their current levels of understanding and seek out ways to develop their knowledge through scaffolding, group work and varied and communicative activities.

The concept of the 'Zone of Proximal development' (ZPD), developed by Vygotsky (1978) to illustrate the range of tasks that a child can complete, is another feature of constructivist thought that is often referenced in CLIL literature. The lower limit of ZPD is what a child can achieve independently (also referred to as the child's actual developmental level), while the upper limit is the level of skill that a child can reach with the assistance of a teacher or more capable peer (Vygotsky, 1978). Teachers must therefore look at students' potential as well as what they already know. 'Pedagogy must be oriented not to the yesterday, but to the tomorrow of the child's development. Only then can it call to life in the process of education those processes of development which now lie in the Zone of Proximal Development' (Vygotsky, 1987: 251-252).

2.1.2 Immersion education

The aim of this section is to look at the immersion and bilingual programmes that developed from the 1960s onwards in Canada, the US and Europe, and show how these experiments in bilingualism contributed to the development of CLIL.

The term 'immersion education' originated in the late 1960s to describe the French-medium classrooms that developed in Canada, and has been used ever since to define various programmes around the world inspired by the Canadian model (Johnson and Swain, 1997). Canadian immersion education was developed to give children from the English-speaking majority the opportunity to become fluent in French, and like CLIL was driven by both grassroots pressure and government policy (Coyle, Hood, Marsh, 2010). Parents and teachers both recognised that traditional French teaching was not enough to produce fluent French-speakers, while at the same time politicians believed that an immersion-strategy would strengthen national unity. The starting age for immersion in Canada varied from kindergarten to 12 years and the extent of immersion varied between 50% and 100% (Baker, 1988). When it was introduced in 1965, Canadian immersion education was regarded (within Canada at least) as a 'radical educational experiment' (Genesee, 1994: 2), and extensive research was undertaken to evaluate the effectiveness of these programmes which involved 300,000 pupils.

Developing separately in the 1950s, the European Schools are a group of institutions that provide immersion education to the children of personnel of European institutions. In 2002, 17,000 children of 50 nationalities and 30 language backgrounds were enrolled in such schools. Immersion education also developed in the USA to help non-native speakers of English integrate into mainstream education. CBI (Content-Based Instruction) and FLAC (Foreign Languages across the curriculum) were two other American-based approaches to integrating content and language learning, this time aimed at adult learners.

2.1.2.1 Research findings from immersion education

The language-learning goal in immersion programmes was not grammatical perfection but meaningful communication among students and teachers. Students did not engage in 'practice' as they did in traditional foreign-language learning, but instead were involved in 'creative construction', experimenting with language so they could use it to communicate with the teacher and their peers. Errors were not seen as mistakes, but as signs that the learner was making an effort to master a new language, and the achievement of language goals was a bi-product, as language learning took second place to content learning (Genesee, 1994).

In research into the Canadian schools, students' receptive skills in French were close to the level of native speakers by the end of elementary school. However, their spoken and written skills were considerably behind, particularly in grammatical aspects of the language (Harley, Allen, Cummins, and Swain, 1991). Students' productive skills were weaker, the result of limited interaction with French speakers outside the classroom, and a lack of speaking practice in the classroom, due to a prevailing transmission-orientated pedagogy (Cummins, 1996). Teachers did not encourage the use of oral or written French for creative or problem-solving activities (Harley et al, 1991), and immersion pupils read less authentic French literature and were not involved in as much creative writing as students learning through English (Cummins, 1987). An 'immersion interlanguage' developed (Lyster, 1987) from teachers not wanting to over-correct and discourage their students. As a result, the French that students and teachers used in the classroom, while sufficient to communicate in that setting, would not have been good enough for real-world interactions.

Two approaches worked well in improving students' language skills. Firstly, in classrooms where lessons were activity-based and students were given regular opportunities to speak in an interactive and task-based environment, students achieved similar levels of proficiency in speaking and listening to students who spent all day in teacher-led instruction, despite only spending 40% of the day learning through French (Stevens, 1976, as cited in Genesee, 1994). In a second study, a more form-focused instruction was tested (Lyster, 1994). Pupils took part in guided practice activities and role-plays and received correction from teachers and peers. Meanwhile, students in comparison classes continued with regular lessons without the language input. The learners in the experimental classes achieved much better results in written and oral production tasks and multiple-choice tests.

Content learning outcomes in bilingual and immersion classrooms tended to receive less attention from researchers than language learning outcomes, and as a result there is less information available in this area. The research findings that are available point to immersion learners either equalling or surpassing their peers in content learning.
In studies on Canadian immersion programmes, Cloud, Genesee and Hamayan (2000) found that learners achieved as well as non-bilingual learners on standard mathematical

tests. Furthermore, early total immersion pupils obtained similar results in science, history and geography (Baker, 1988).

Studies on immersion education reported that bilingualism had a positive effect on a child's intellectual and linguistic development. Early total immersion pupils in Canadian immersion programmes displayed more substantial increases in IQ, and better performance on tests to measure verbal and non-verbal creativity and cognitive thinking than comparable mainstream children (Swain and Lapkin, 1982).

There is further evidence of successful learning outcomes outside Canada. In Housen's study of European Schools (2002), he details successful learning outcomes among students studying for the baccalaureate programme, with more than 90% of students passing their final exams, and many progressing to university in countries where the L2 rather than L1 was spoken. De Jabrun (1997), writing about a project in Australia, found immersion maths students outperformed mainstream students a year after the course had finished. While, Senasac (2002), investigating a US bilingual programme, reported students experiencing partial immersion in English achieved higher scores in language, maths, science and social science.

While the Canadian immersion programmes were successful in terms of teaching French to English speakers, this new group of French speakers were reluctant to interact with French-speakers outside the classroom (Genesee, 1978). Stern (1984) suggested this resistance to communicating could have been remedied with an educational experience that embedded the values and culture of French children and taught biculturalism as much as bilingualism. The European schools mode, in contrast, which had the development of pluralistic identities for students among its aims, enjoyed more success in this area. The goal of the ES model was for children to maintain their home culture and identity, while developing a 'supra-national "European" identity' (Housen, 2002: 3). Research in 1987 by Housen and Beatens Beardsmore found that childrens' choice of friends became increasingly cross-linguistic during secondary school (when pupils started taking content lessons in the target language). The study also found that students developed a positive attitude to other nationalities, with few problems existing between the different nationalities and language groups.

In terms of pupils' L1, findings from French immersion programme evaluations show that native English-speaking children caught up in most aspects of English within a year of being introduced to formal English language arts (Cummins, 1998) and had similar levels of written English to non-immersion pupils (Swain, 1975). Cummins and Swain (1986), investigating immersion classrooms in Canada, found that students instructed through a minority language did not experience any harm to the majority language, even though they spent much less time studying it than their contemporaries outside immersion programmes. This finding lends support to the 'interdependence principle' outlined as follows: 'To the extent that instruction in Lx is effective in promoting proficiency in Lx, transfer of this proficiency to Ly will occur provided there is adequate exposure to Ly (either in school or environment) and adequate motivation to learn Ly' (Cummins, 1981: 29). In other words, a programme that develops reading and writing skills in one language (French) also enhances literacy in the majority language (English). There is thus an 'underlying cognitive-academic proficiency that is common across languages' (Cummins, 1998: 5) and first and second language academic skills are 'interdependent'.

Despite the positive effects of immersion education on learning, high rates of student drop-out characterised French immersion programmes in Canada throughout its existence, with large numbers of students transferring to L1 classrooms. In one report from Alberta in the 1980s and 1990s, between 43% and 68% of students had dropped out by grade 6 rising to between 88% and 97% leaving by grade 12 on some courses (Keep, 1993, as cited in Cummins, 1998). Academic and behavioural problems were cited as the main factors for students opting out of the courses in the study.

CBI in the US achieved greater success in enhancing student motivation and cultural literacy. The notion of sheltering content developed with CBI, signalling a move away from heavy emphasis on transmission mode instruction to classrooms that involved group activities, project work and audio-visual aids (Klee and Tedick, 1997). Corin (1997) also found CBI and FLAC classrooms enhanced student motivation and self-confidence due to a combination of interesting content and task-based learning. Since these American programmes were aimed at university level age students and above, it is difficult to draw parallels with the Canadian programmes, which were intended only for school-aged pupils.

2.1.2.2 Conclusions from the immersion programmes that preceded CLIL

The immersion programmes in Canada, the European Schools and in the USA all reach similar conclusions, which I summarise below:

- Content and language learning should be integrated.

When foreign languages are taught in isolation, they become 'dissociated from other aspects of human development' (Genesee, 1987), which does not happen when language and content are integrated. Research findings from the Canadian schools found that pupils were better able to learn the target language when there was a focus on form (Lyster, 1994). Teachers need to think carefully about the language they need to model to help pupils achieve academic tasks (Snow, Met and Genesee, 1989). At the same time, they must plan courses that take into account the structures that pupils will need (Swain, 2000).

- Learners need the opportunity for meaningful communication.

When pupils have the opportunity to communicate in meaningful and significant social situations, they learn language more effectively (Genesee, 1987). When students in Canadian immersion classrooms did not have the opportunity to practise speaking, their productive skills were weaker (Cummins, 1996) and an 'immersion interlanguage' developed, which meant pupils lacked the communication skills for real-world interactions (Lyster, 1987).

- Learners need interesting content and varied tasks.

Students benefit from interesting content that gives them a foundation for understanding and learning new language (Genesee, 1994). Pupils learned more French in activity rather than in transmission-based classrooms (Stevens, 1976, as cited in Genesee, 1994) and the emphasis on group activities and audio visual aids meant CBI learners experienced high levels of motivation (Klee and Tedick, 1997).

All of these conclusions, have been influential in the development of CLIL methodology, as we will see in the next section.

2.2 CLIL methodology

The term 'Content and Language Integrated Learning' (CLIL) was first used in the mid-1990s to describe what was already taking place in schools across Europe. Adopted by EUROCLIC (the European Network of Administrators, Researchers and Practitioners), the umbrella term was coined to define CLIL in contrast to related approaches such as Content-Based Instruction (CBI), bilingual teaching and sheltered instruction (Coyle, 2008). Although similar to these approaches, 'in essence it operates along a continuum of the foreign language and the non-language content without specifying the importance of one over another' (*Ibid*: 2).

As with the Canadian experience, the impetus for CLIL in Europe came from ground level on the one hand, and from political pressure on the other. While teachers and schools created their own programmes, transnational initiatives often received European Union or Council of Europe funding. This meant that CLIL became legitimised in government policy (Dalton-Puffer, 2007). The contrast between grassroots endeavours on the one hand, and European-led initiatives on the other, has led Dalton-Puffer to call for the gap between them to be filled with information on activities and methods exchanged between the two sources.

While a comprehensive CLIL methodology has yet to be developed (Meyer, 2010), a number of corresponding approaches have evolved which broadly agree on what CLIL is, what it isn't, and how it should be practised. These approaches, which offer curriculum and lesson planning guidance to teachers, are Do Coyle's 4Cs Framework (1999), Peter Mehisto and Sandra Lucietto's CLIL essentials (2010), and Oliver Meyer's CLIL core elements (2010). The similarities between these approaches, mean they can be examined simultaneously through the four strands of Coyle's 4Cs framework, which are broad enough to encompass additional ideas on good practice in CLIL.

2.2.1 The 4Cs Framework

The 4Cs in Do Coyle's Framework encompass the essential building blocks of CLIL. Starting with content (themes and subject matter), the framework focuses on the relationship between content, communication and cognition, all of which are woven together by the context of culture and intercultural understanding.

> Connecting the 4Cs into an integrated whole is fundamental to planning. For example, exploring how cognitive elements interconnect with content will determine the type of tasks which will be planned. Similarly, relating cognition to communication will demand careful consideration of classroom activities to ensure that learners not only have access to the content language, but also to the classroom language needed to carry out the tasks.
>
> (Coyle, Hood and Marsh, 2010: 55)

The **content** strand is the subject or theme, and is usually a curriculum subject such as history or geography. Learning content is not only about acquiring knowledge and skills, but about 'learners creating their own knowledge and understanding and developing their own skills' (Coyle, Hood and Marsh, 2010: 42). Teaching a curriculum subject in the target language in the hope that students will somehow absorb the new language and content is therefore not enough (Coyle, Hood and Marsh, 2010; Marsh, Enner and Sygmund, 1999). Instead, a strategic approach is needed to take into account students' varied and often limited levels of the target language.

According to Meyer, 'meaningful, challenging and authentic' input (2010: 13) is necessary to ensure that the affective filters (Krashen, 1985) of students are open to accepting new knowledge and linking it to prior experiences. In terms of subject matter, this means content that focuses on global problems that relate to the lives of students (Meyer, 2010), something that Corin (1997) noted had a beneficial effect on students in CBI programmes in the US.

Meyer recommends using interactive materials such as video clips, webquests and podcasts to motivate students and provide them with rich and authentic language. He calls for a reevaluation of the teacher's role, and a balance between teacher-led and learner-led tasks. Furthermore, using 'multi-modal input' in the form of visual materials, texts, maps, etc. enables 'a deeper understanding of the specific subject content' (Meyer, 2010: 13) and helps clarify complicated ideas, which are challenging enough in a learner's L1, and considerably more so in the target language. Multi-modal teaching styles and a more task-based learning environment were all found to have a positive effect on pupils studying in Canadian immersion and CBI classrooms (e.g. Stevens, 1976, as cited in Genesee, 1994; Klee and Tedick, 1997). Mehisto and Lucietto (2010) agree with Meyer and make 'scaffolding content' one of their 'CLIL essentials'. They recommend the use of graphic organisers and analogies, connecting content to students' lives and reducing the quantity of information presented in one lesson.

The **communication** component of the 4Cs is labelled as such intentionally to highlight the difference between learning a language (with the emphasis on grammar) in a traditional language learning classroom, and using language to learn and communicate in a CLIL environment (Coyle, Hood and Marsh, 2010). The communication aspect of CLIL shares many similarities with Communicative Language Teaching (CLT). According to Hymes (1972), the goal of language teaching should be to develop 'communicative competence', which is what a speaker needs to know to be able to communicate competently in a speech community. CLT emphasises fluency over accuracy and teaching language that is meaningful to the learner. In practice, this involves classroom activities that promote learning through communicating in meaningful tasks (Johnson, 1982). As we saw in the research into Canadian immersion classrooms, pupils who did not have the opportunity to speak were not able to develop productive skills to match their receptive skills (Cummins, 1996), so emphasising the communication aspect of CLIL means that this aspect of learning should not be forgotten by teachers.

Features of Task-Based Learning (TBL) have also been integrated into the communication aspect of CLIL. In TBL (Willis, 1996) the main focus of classroom activity is the task, and language is the tool students use to complete it. Like CLT, TBL has a learner-centred essence to it. Dalton-Puffer describes CLIL as the 'ultimate dream' of these two approaches 'rolled into one', since the richness of the topics and concepts can become the object of 'real communication' (2007: 3).

As we saw earlier in this chapter, research on Canadian immersion classrooms found that pupils in bilingual education performed better in tests to measure IQ and verbal and non-verbal creativity and cognitive thinking (Swain and Lapkin, 1982). The **cognition** aspect of CLIL means teachers should challenge pupils in CLIL environments to create their own content and language knowledge in CLIL, and to be engaged in higher-order thinking. As well as learning new content and developing language skills, students' thinking and problem-solving skills must also be developed. Through being taught specific thinking skills, learners are better able to manage the complex academic and cognitive demands of learning content subjects in a foreign language (Brewster, 2009).

Cummins' work on BICS and CALP in Canadian immersion classrooms provides a useful illustration of the way CLIL or immersion education helps students develop different types of language competences. BICS (Basic Interpersonal Communicative Skills) is the fluency that all native speakers possess and that language learners usually develop after spending 1-3 years studying a foreign language. CALP (Cognitive Academic Language Proficiency) is the ability to use language in an academic context. It is the kind of language proficiency that occurs when higher-order cognitive processes are at work, and typically takes 7-10 years for a language learner to acquire. In a content-led approach, students need to have their CALP competence developed from the outset in order for them to be able to learn the content (Cummins, 1979).

The axis of Cummins' BICS/CALP matrix (1979) represents a continuum from 'context-embedded' to 'context-reduced', ranging from activities where students can use clues such as facial expressions and real objects to aid understanding, to those where students must rely solely on their linguistic knowledge. The horizontal line shows the degree of cognitive challenge involved in a task. The CLIL Matrix is an adaptation of this, and is a useful tool for CLIL teachers attempting to balance linguistic and cognitive demands in their lessons, and for ensuring students are cognitively engaged at an appropriate level (Coyle, Hood and Marsh, 2010).

Quadrant 1 – LOW linguistic demands and LOW cognitive demands
Quadrant 2 – LOW linguistic demands but HIGH cognitive demands
Quadrant 3 – HIGH linguistic demands and HIGH cognitive demands
Quadrant 4 – HIGH linguistic demands but LOW cognitive demands

While the level of quadrant 1 is suitable for building initial confidence and may be used as a warm-up, it is essential to focus on quadrant 2, which ensures that the limited language skills of the learner does not restrict learning. The level of quadrant 3 is appropriate when learners show they can manage a targeted progression in language learning as well as with high cognitive challenge. Quadrant 4 should be avoided altogether.

Bloom's taxonomy (1956), like Cummins' BICS/CALP matrix, shows how different classroom tasks vary in their cognitive demands. Bloom placed six thinking skills on a continuum from lower to higher order skills: knowledge, comprehension, application, analysis, synthesis and evaluation. According to this system, lower order skills involve recalling knowledge to identify, name or describe things, while higher order skills require the application of knowledge to understand something more fully, make critical judgments about it, or create something new.

The revision of Bloom's taxonomy by Anderson (a former student of his) and Krathwohl (2001) adds a knowledge dimension, representing a range of knowledge types from concrete (factual) to abstract (metacognitive). This connection of thinking process to the learning and constructing of knowledge 'resonates' with 'conceptualizing content learning' in CLIL classrooms (Coyle, Hood and Marsh, 2010: 30). Moreover, it is reflected in the integration of cognition and content in the 4Cs framework. The cognitive process dimension in Bloom's taxonomy provides helpful guidance to teachers in classifying activities on the CLIL matrix, e.g. remembering in quadrant 1 or 4, evaluating in quadrant 2 or 3. Teachers can therefore scrutinise the intellectual demands of different types of knowledge, and plan lessons accordingly (Coyle, Hood and Marsh, 2010).

The **culture** aspect of the 4Cs Framework is not so much a distinct entity as the context that holds the other 3Cs together. Tolerance and understanding is necessary for our pluricultural world to be 'celebrated' and for its full potential to be realised (Coyle, Hood and Marsh, 2010: 54). In addition to this, the more individuals are globalised, in terms of their knowledge of and encounters with other cultures, the more cooperative they are (Grimalda, 2006). CLIL, by its very nature of using a foreign language as the medium for studying content, holds great promise as an environment where intercultural skills can be developed, and knowledge of citizenship and other cultures gained. In Spain, school pupils study citizenship as part of their social science curriculum, with topics such as European Union membership and immigration taught from 5th of primary (when they are 10-years old). Including cultural content in CLIL lessons, however, must be managed carefully, and should be carefully planned to avoid ‘tokenistic reference’. Teachers can look for opportunities to extend themes to include cultural information, e.g. looking at earthquake zones around the world and the way that different countries plan for earthquakes and manage the aftermath. Seeing topics from the perspective of different cultures and understanding that other cultures see things differently is one of the great advantages that CLIL can provide (Meyer, 2010).

Students should also develop intercultural competence in addition to their communicative competence. As well as learning how to speak a language, they should learn the ‘hidden cultural codes’ (Meyer, 2010: 20), its paralinguistic features, and about societal norms to help them get on with, and avoid offending, speakers of the target language. In CLIL essentials, Mehisto and Lucietto (2010) recommend connecting with CLIL language speakers through email projects, student exchanges and Internet forums as a way of achieving the intercultural aims of CLIL.

In addition to the 4Cs, there are some other key elements that are central to a CLIL approach that do not fall outside these main parameters. For example, Mehisto and Lucietto (2010) include ‘creating a secure learning environment’ as one of their ‘CLIL essentials’. They suggest that students be involved in the establishment of rules, that they should not be labelled, and that no ridicule or sarcasm be allowed to feature in CLIL classrooms. These points should be considered good practice in all classrooms, CLIL or otherwise. However, the CLIL experience as a new and potentially unsettling approach to learning could lead to students feeling more vulnerable than usual, so extra care must be taken to make them feel comfortable and secure. In the same document, Mehisto and Lucietto are at pains to outline that CLIL is not simply a matter of changing the language of instruction ,or a course for high achieving students or a tool for L1 submersion.

2.3 Science learning theory

Before I look at research findings into CLIL, I am going to review some of the literature on science education, since the classrooms that are the focus of this thesis involved pupils learning science.

2.3.1 Why is science so difficult?

Taking a subject as abstract and complex as science and distilling it to a level of simplicity that young learners can grasp is not without its problems. On the one hand, the laws of science often run contrary to common sense (Wolpert,1992), while on the other, the 'paradigmatic variety' of contemporary science and the quest for new ideas is at odds with the teaching of factual knowledge, which remains a feature of classrooms throughout the world (Monk and Dillon, 2000).

In 'The unnatural nature of science' (1992), Wolpert describes a world that is not built on the basis of common sense. Scientific ideas, he says, are mostly counter-intuitive and observing the natural world does not lead to scientific understanding. An example he uses to illustrate this point is the Solar System. Seeing the Earth as a sphere that orbits the Sun is not something an individual living on this planet would imagine, hence the relatively recent discovery of this phenomenon in human history. While this knowledge of the planets is now part of our shared understanding, much 'everyday knowledge' exists which can lead individuals to form incorrect scientific views. This everyday knowledge may not necessarily be wrong, but it is very different to 'scientific knowledge', a more formalised way of thinking developed by scientific communities and learned through explicit teaching (Leach and Scott, 2000).

What can be problematic in science education is the gap between students' everyday views and the scientific view of the world. This can be so great as to hinder learning (Leach and Scott, 1995). For example, a child who understands drinking through a straw in terms of 'sucking', may founder when presented with the concept of air pressure to explain the phenomenon in a science lesson (Leach and Scott, 2000). This difference between the everyday and scientific view of the world, and the challenges that students face in internalising and understanding scientific phenomena, is described as the learning demand (Leach and Scott, 1995).

Learning science in school, then, involves coming to know and use the tools and language of the scientific community, and often involves overcoming and unlearning incorrect (or at least everyday) knowledge. Driver and Leach (1993), looking at science teaching from a constructivist perspective, argue that children do not learn in a vacuum, but bring their existing knowledge to the classroom. If their learning experience 'fits' with the knowledge they already have, there is little change in their schemes. However, if they experience something new, the students may change their knowledge schemes as a result.

> This process of using and testing current ideas in new situations requires active involvement of students in drawing on their present schemes, relating them to new tasks, and perhaps reorganising them. In this way, learning science is seen to entail the progressive development and restructuring of learners' knowledge schemes.
>
> Driver and Leach (1993: 104)

Driver and Leach call for teaching to involve not the transmission of knowledge, but to involve tasks designed to help students understand the perspective of the scientific community.

2.3.2 The nature of scientific knowledge

The nature of scientific knowledge and method has evolved from the 19th century empiricism of Ernst Mach (1943) and the Vienna Circle, who claimed that the only things which can be given the status of scientific knowledge are the observable laws of the natural world. Logical positivism (e.g. Carnap, 1966) is a variation of empiricism that brings theories of what is not observable into play, and involves scientists using empirical tests to confirm these theories. As a philosophy of science, it suggests that scientific knowledge is achievable through a combination of empirical study and logical deduction (Monk and Dillon, 2000). Both empiricism and logical positivism have made way for falsificationism (Popper, 1972), an alternative position which suggests that empirical tests cannot prove a theory, as not enough evidence exists to show something is true. On the contrary, they can only show that a theory is false. Objective knowledge, therefore, is always subject to further investigation and as a result is incomplete.

While falsificationism and hypothetico-deductivism are now established approaches in higher education, schools have remained rooted in empirical and positivist methods of inquiry (Monk and Dillon, 2000). Empiricism is often seen at work in contemporary UK secondary schools, where students design tests and collect data to prove or disprove empirical relationships. At the same time, logical positivism in the classroom involves teachers planning activities that illustrate established theories, rather than exploring them in depth.

2.3.3 Dialogic teaching

In many classrooms around the world, and in particular in North America and Europe, dialogic teaching (Wells, 1999; Alexander, 2001) has become a popular teaching method among content teachers. In some ways, this approach resembles transmission-style teaching, in that a teacher is typically facing a group of pupils and doing much of the talking. However, pupils are much more involved in the learning process. Through reviewing the work of Vygotsky (1978) and Bakhtin (1986), Wells challenges the prevailing view that knowledge is transmitted by teachers and received by students. Instead, he argues, the process is far more intricate as ideas 'do not exist outside of the semiotic processes through which they are formulated' (Wells, 1999: 106). They are shaped by the context in which they happen. 'Knowing then, is both situated and dialogic' (*Ibid*: 106).
In 'Towards Dialogic Teaching' (2012), Alexander contends that in the UK and the USA, in contrast with other countries such as India, Russia and France, there is too much emphasis on writing and not enough on speaking. In countries where oracy is more highly regarded, the relationship between speaking, reading and writing is explicitly stated rather than accidental, and 'talk is seen as intrinsic to literacy, not as separate from it.' (Alexander, 2012: 19). Moreover there is a tradition of oral pedagogy which stretches back for hundreds of years, and makes speaking an established part of the cultural experience of students, teachers and parents. In the UK on the other hand, written work is granted a higher status, and talk is seen as primarily social and more about providing students with the confidence to communicate ideas than as a tool for acquiring them (Alexander, 2012). However, according to recent neuroscientific research, talk is necessary for learning, strengthening and building the synapses in the brain and developing its power (Johnson, 2004). These research findings are useful for those promoting dialogic teaching through the interactive environment of a classroom (Alexander, 2012).

Neil Mercer adopts a very similar approach to Alexander, looking at teaching styles around the world to assess the most effective guidance strategies for knowledge sharing. He describes a learning encounter in Zimbabwe where young girls are educated about their future adult lives through a fire-side conversation between an aunt and a girl acting as a 'provacatrice' to question the aunt's authority (Mercer, 1995: 53). Based on these observations in traditional societies and others in North America and the UK, he explains how teachers elicit from students, respond to what students say, and describe shared classroom experience to show learners they have a 'collective understanding'. Teachers, according to Mercer, are 'discourse guides' within classrooms which are 'discourse villages' and 'have to use educational discourse to organise, energise and maintain a local mini-community of educated discourse' (Mercer, 1995: 83). To successfully develop joint understanding in their classrooms they need to establish 'context', to provide meaning to the talk, and 'continuity', so ideas and themes are revisited to consolidate understanding. In practice, dialogic teaching must mean asking pupils questions that stretch them and invite them to participate. While there is a tradition of asking pupils 'low-cognitive questions' in most levels of school science lessons, research shows that when teachers ask questions that go beyond testing knowledge and that elicit explanations from students, they generate better learning outcomes (Rojas-Drummond and Mercer, 2004; Alexander, 2001) In these studies, teachers asked for extended answers and involved learners in the co-construction of knowledge. This 'dialogic teaching' (Wells, 1999; Alexander, 2008) sees teachers becoming aware of the role of their talk (their main teaching tool) and thinking about how it can be used effectively to support learning.

2.3.4 Using predictions

A specific example of dialogic teaching is the use of predictions to give students the opportunity to think about what will happen in an experiment before actually conducting it. Wells (1999) uses an experiment conducted by grade 4/5 students to demonstrate the importance of predicting. The experiment was designed to answer the question ¨Does mass change when matter changes state?¨, and involves students melting and then refreezing a block of ice to see if the mass remains the same or changes. Teachers insist on students making predictions before conducting an experiment to ensure that the process of performing experiments does not make students lose sight of the goals. Using predictions can get students to share the teacher's goal for the lesson and to see the experiment as an opportunity to prove or disprove understanding (Wells, 1999). In the experiment with the block of ice, the function of the prediction is key. Students have to theorise and examine their own beliefs about a scientific question, incorporating other relevant knowledge, and this reasoning process is as important as the predictions themselves (*Ibid*). By sharing predictions before starting an experiment, students can benefit from the ideas of the whole group, while students learn that predictions should be supported by reasons that are 'logically consistent and coherently expressed' (*Ibid*: 217). Moreover, by making predictions, students can mirror what happens in scientific research, where scientists consider and evaluate a range of possible explanations for phenomena based on ideas that have gone before.

2.3.5 Practical work and models

Dewey (1938) argued that traditional schooling did not provide genuine learning experiences, rather an accumulation of endless facts which were soon forgotten. For students to learn, he advocated a more involving experience for students who would learn by doing and reflecting on what had happened.

Combined with the influence of Vygotsky and other social constructivist writers, schools in Europe and the USA have increasingly engaged their students in practical activities to the point where few contemporary students miss out on the chance to play at being scientists during their school careers.

The effectiveness of practical work is rarely questioned, forming as it does such a central role in science education, with teachers convinced of its worth in helping students learn scientific concepts and develop laboratory skills. Watson (2000) suggests that rather than engaging in practical work without questioning its value, we should ask, 'what kinds of practical activities can be used to achieve particular aims?´ By looking at studies conducted over the past 50 years (Kerr, 1964, Beatty and Woolnough, 1982 and Swain and Lapkin, 1998), Watson identified four aims of practical work among teachers that have remained popular as: encouraging accurate observation; making phenomena more real; arousing and maintaining interest; promoting a logical and reasoning method of thought.

By 1998, in addition to these enduring aims, Watson (2000) added new objectives to reflect the impact of social constructivist ideas on classroom practice. These were: practising observing problems and seeking solutions for them; developing a critical attitude; developing the ability to work with peers; identifying facts and arriving at new principles.

The assumption that practical work helps students learn is not supported by research. A 1995 study by Watson, Prieto and Dillon showed that students in England, who had been involved in a large amount of practical work, had similar academic knowledge to Spanish students of the same age, with little practical experience. Hodson (1993) moreover, points out that far from encouraging a value-free and objective perspective, practical work in schools is above-all concerned with seeking correct answers that match the text book. In order to address the deficiencies of aimless practical work, Watson suggests that the theory and practice of science be more closely related, and students should be made aware of the rationale behind the activities they do in class.

Another recent innovation in science education is teaching with models which has been adopted as education policy in the United States by the NSES (National Science Education Standards). According to Gilbert and Ireton (2003), by getting students to construct models that represent scientific concepts, their fragmented knowledge can be assembled into more coherent and clearly understood ideas.

> The act of building a model requires students to think about and discuss a science concept, breaking it down into pieces (facts) and considering how (and why) those pieces are related. Choosing a useful model is one of the ways intuition and creativity come into play in science
>
> Gilbert and Ireton, 2003: VI

A model consists of objects or symbols that represent a ‘target’. For example, a vacuum cleaner (a model) can be used to represent a tornado (a target). While models do not need to look exactly like their targets (as in the vacuum cleaner example), learners must be able to understand how they relate to each other, and also how to differentiate them from each other. Models can be physical, in the case of a scale model of the solar system created on a playing field using different size balls to represent the planets. They can also be diagramatic (in the form of flow charts and topological maps), computer-generated or theoretical. Their effectiveness or not lies in their ‘fitness for purpose’, their ability to simplify and convey an idea, and assessing their usefulness should be a constant feature of science lessons. Gilbert and Ireton (2003) argue that one model alone is generally insufficient to teach an idea, and students benefit from multiple models that show different aspects of phenomena. The more models students have access to, the richer their understanding.

In this section, I have looked at science teaching in mainstream L1 education. The research shows us that even when pupils are learning science in their own language, transmission models of teaching are not enough to help them learn this complicated subject matter. Instead, students need support in constructing their own knowledge, which is best achieved with dialogic teaching (Mercer, 1995; Wells, 1999) and tasks that involve and challenge the learner (Driver and Leach, 1993) and enable them to bridge the gap between their everyday view and scientific view of the world (Leach and Scott, 1995).

2.4 CLIL Research Findings

2.4.1 Content learning

Obtaining reliable data on content learning outcomes has proved problematic since few countries administer standardised exams in science and social science subjects (Dalton-Puffer 2011). Coyle, Hood and Marsh (2010) outline three ways to evaluate content learning outcomes, through tests in the CLIL-vehicular language, tests in the students’ L1 and portfolios of work. They argue that tests translated from the students’ L1 into the CLIL target language may not provide reliable results if students are required to produce long written answers, beyond their language abilities. Effectively such tests would become language exams as well as content exams, even in terms of the comprehension of rubrics and tasks.

Nonetheless, adapting tests so that students can show their understanding through tables, visuals or oral presentations may overcome this problem as long as the complexity of concepts and of thinking is not compromised by this process. Similarly, exams set in students’ L1, enabling them to answer in the comfort of their own language, may be too challenging if students are only familiar with the subject-specific terminology in the CLIL language. A better assessment of students' learning, therefore, can be achieved through portfolios of written work produced by CLIL and non-CLIL students, and compared by 'professionals working in the content subject areas' (Coyle, Hood and Marsh, 2010: 139). In reality, though, the culture of many European countries, including Spain, is to test students regularly on what they have studied in the classroom. In Spain, exams are usually in the target language, but there are exceptions. For example, the *selectividad* university entrance exams are in students' L1, regardless of the language the content was studied in. Secondary school students sit around two exams per term in each subject. The research that has been conducted into content learning outcomes is, as a result, largely based on exam data rather than portfolios.

Positive results

Teachers and parents alike worry that students enrolled in CLIL programmes will receive a reduced and simplified version of a subject either because teachers typically slow down the pace of learning and make it easier for students, or because learners miss much of what they are told due to limited proficiency in the target language (Hajer, 2000, as cited in Dalton-Puffer 2011). Content learning results for CLIL students would therefore be expected to not be as good as for students who learn the same content in their L1. However, this concern has not been confirmed by recent published surveys, which report CLIL students outperforming their non-CLIL peers (Lasagabaster, 2008; Campo, Grisaleña and Alonso, 2007; Van de Craen, Ceuleers and Mondt, 2007; Vollmer, Heine, Troschke, Coetzee and Kuttel, 2006, as cited in Dalton-Puffer, 2011, and Fabregat, Roig, Adsaur and Sevillano, 2005).

Lasagabaster (2008) examined the implementation of CLIL in the Basque Country among 198 secondary school students across four schools and found that CLIL learners made gains over non-CLIL learners, not just in terms of language learning but in their understanding of content. The students who participated in the CLIL programme chose to do so, and Lasagabaster concedes that these students may have been more gifted or motivated to learn English than those who did not volunteer for the course. The study overcame some of the testing problems described by Coyle, Hood and Marsh (2010) by combining writing tests with individual speaking tests that were recorded for later evaluation.

Campo, Grisaleña and Alonso (2007) also investigated students in the Basque Country in a longitudinal study. Teachers answered a questionnaire on whether the level of knowledge of the subjects taught in English was reduced in comparison to when it is taught in Basque or Spanish. The authors conclude that students taking the subjects in English have a 'similar level' to those taught in their L1, with 'superior academic performance' (2007: 31) among those participating in the experience. Campo et al acknowledge that a reason for this greater academic performance is 'due both to the prior selection and to the high motivation and interest on the part of the families and students'. (2007: 31) This conclusion is made, despite a selection procedure in which students in the CLIL and control groups were required to be matched up in terms of previous academic achievement, motivation to learn and gender. Campo et al attribute the success of the course to the 'flexibility and diversity' of materials, the 'positive attitude' of students involved in the programme and the more 'dynamic and cooperative methodology'
In a Belgian study, Van de Craen et al (2007) evaluated the performance of young mathematics students and found that CLIL pupils outperformed non-CLIL pupils' on standardised mathematics tests, even when students had not studied mathematics (but other content subjects) through CLIL language. The authors point to students' enhanced cognitive abilities resulting from the richness of the linguistic setting as the reason for these surprising results. A number of factors could explain these improved results among CLIL students. It is possible that some of these positive results are due to CLIL students being, in general, star pupils to begin with, who are either selected by teachers who think they will cope with the pressures of the course, or who have the self-motivation to take on the additional challenge. This is a point that Campo et al (2007) and Lasagabaster (2008) both acknowledge.

Hellekjær, in his 2010 study of Norwegian universities, found a quarter of university students reported finding lecturers difficult to following in their L1 as well as in English. Students who learn with a different teacher to the control-group students may achieve better results due to the ability of the teacher to engage them and present the material in a clear and coherent way. For example, in a study in Barcelona, Fabregat et al (2005) observed that students learning science in English did better in the English term than in the Catalan term. They claim that the innovative teaching methods were well-received by students and motivation was high. While the authors accept that the required degree of difficulty was slightly less in English than in Catalan, the methods adopted were 'active, participatory and game-like' (2006: 65) and teachers use video, computer learning programmes and field work to create a multi-modal and dynamic learning experience.

The ability of students to work persistently on tasks in a CLIL setting is another contributing factor in content learning success. In a summary of research by Vollmer et al (2006, as cited in Dalton-Puffer, 2011) points out that students who experience problems with the language, rather than abandoning their task, experience 'intensified mental construction activity' which results in 'deeper semantic processing and better understanding of curricular concepts' (*ibid*: 188). Learning through CLIL, and all the associated difficulties with language, could be an advantage for students then, rather than a disadvantage.

Westhoff (2004) uses the analogy of a pinball machine to describe how well-designed tasks can lead to better learning outcomes. In successful tasks, the ball is kept in play as long as possible through a rich variety of activities that stimulate students' brains through connectionism. CLIL, with its informative, life-like and functional tasks, he argues, provides ideal conditions for students to learn, which is why it is 'booming' in so many European countries.

Mixed and negative results

Less positive, or at least mixed results, have been reported by Admiraal, Westhoff and de Bot (2006), Jappinen (2005, as cited in Dalton-Puffer, 2011) and Badertscher and Bieri (2009, as cited in Dalton-Puffer, 2011). Admiraal et al used school leaving examination test scores to assess how well students had understood the geography and history content, which was taught entirely in English. While the exam results show strong results in favour of the CLIL group, only a limited dataset was available due to a low proportion of students taking these courses and sitting these exams. Jappinen (2005, as cited in Dalton-Puffer 2011) found mixed results from students studying mathematics in Finland, and Baderscher and Bieri (2009, as cited in Dalton-Puffer 2011) reported that CLIL had neither a positive or negative effect on sixth form students in Switzerland studying through French and German, rather than English.

In addition to the more positive or neutral findings, some researchers have observed negative results in terms of the linguistic expression of concepts learnt in a CLIL programme. Summarising recent research on content learning in CLIL, Dalton-Puffer (2011) makes an obvious, though rarely-stated, point, asking 'how could it be possible for learners to produce equally good results when they study in an 'imperfectly known language?' (2011: 189). Students will obviously struggle to understand everything they are told, and teachers, will slow the pace of learning to accommodate this. As a result, it is inevitable that less will be learnt on a CLIL course, and rather than attempting to achieve as much as on an L1 taught programme, perhaps everyone would benefit from some realistic course objectives. Dalton-Puffer herself suggests the answer to this question lies with an investigation of classroom practices, which will be dealt with later on in this chapter.

2.4.2 Language learning

The effectiveness of CLIL courses in improving the language levels of students has received the most attention from researchers. This has particularly been the case in countries such as Spain where mainstream education has failed to create competent English speakers (European Barometer Survey, 2012), prompting the support and funding of CLIL courses as a remedy to this problem.

As in the case of content learning outcomes, obtaining accurate results has proved problematic. Students invariably continue to study the target language in traditional language lessons, therefore gaining a time advantage over their peers (Admiraal, Westhoff and de Bot, 2006, Ruiz de Zarobe, 2008).

Research by Torras. Navés, Celaya, and Pérez-Vidal (2006) found no advantage in starting to learn a language earlier or attending more hours of language lessons. Moreover, Navés (2007) examined the benefits of beginning studying a language at a younger age and of learning for additional hours (for example in an academy). Her results indicate that neither of these factors resulted in any significant improvement in proficiency. However, many teachers working in the field have observed that students who study English outside of school do have higher proficiency levels. For example, Fabregat et al

(2006) worry that those who do not study English outside school have very limited proficiency, especially in speaking skills.

As discussed earlier in this chapter, students are often chosen to participate in CLIL courses on the basis of their already high language levels or their motivation to learn (Lasabagaster, 2008) making success more likely than if, in contrast, students were chosen for their low levels of proficiency or reluctance to study.

CLIL is often viewed as a 'two for the price of one' education solution with schools giving students three hours per week bonus language learning time bundled with a curriculum subject. However, language learning in a CLIL classroom involves more subtle methods and processes, which can lead to better results than if students had spent the same time in a traditional language classroom. Krashen suggested in his 'Acquisition-learning hypothesis' (1981) that there are two ways language is learned, through acquisition and through learning. Acquisition is a subconscious process, which learners are not aware of and requires meaningful interaction in the target language and a focus on meaning rather than grammatical form. Learning a language, on the other hand, is conscious and requires more formal instruction. According to Krashen, it is less effective than acquisition. Students, when they acquire language, should receive input at a slightly more advanced level (input +1) than they currently have (Krashen 1985). By receiving this comprehensible input, students will subconsciously make observations about the structure of language, which they will internalise and which will enable them to produce the language at a later time, when they are ready to do so. A CLIL classroom with its greater emphasis on meaning and content, and very little (if any) focus on language forms provides an ideal setting for acquisition learning.

Krashen also stated that emotions such as anxiety and embarrassment can raise a student's 'affective filter' *(*1985) and be an obstacle to learning. By engaging students with interesting content and creating a low-stress environment, the affective filter can be lowered, while over-correcting errors or expecting students to speak before they have the structures in place can raise the affective filter. The lack of correction characteristic of CLIL classrooms (e.g. Dalton-Puffer, 2007) would meet these criteria. While students are expected to participate in CLIL classrooms, the use of speaking frames and other tools are employed to support students and reduce their stress levels. Krashen's theories fit particularly well with Canadian immersion education, however it was research from Canadian classrooms that led to doubts about the effectiveness of acquisition learning and input+1 in developing learners' productive skills.

Swain and Lapkin (1995) argued that input alone was not enough to develop students' language skills, citing research on the productive skills of immersion students who achieved native-like proficiency in listening and reading skills, but remained identifiable as non-native speakers and writers (Swain, 1985, Genesee, 1987). Students' interlanguage remained 'off-target', which they though was due to the limited production among students. As a result, they developed a hypothesis of their own, which counters Krashen's ideas on 'pull' (that learners are primarily on the receiving end of language acquisition) and suggests that students occasionally 'push' their own development by noticing problems as they try to produce language.

> Noticing a problem 'pushes' the learner to modify his/her output. In doing so, the learner may sometimes be forced into a more syntactic processing mode than might occur in comprehension. Thus, output may set 'noticing' in train, triggering mental processes that lead to modified output.
>
> Swain and Lapkin, 1995: 372-3

In research conducted to test this hypothesis, Swain and Lapkin found young adolescent students identifying gaps in their knowledge as they tried to draft and rewrite an essay. Resulting from this research, Swain and Lapkin provide an outline of second language learning from an output perspective. In this scenario, a student notices a problem, analyses it, and as a result they modify their output. Students who do this make the leap from 'semantic to grammatical processing' (1995: 386), as a direct result from the need to communicate.

Language skills can also be developed through interaction (Long, 1996, as cited in Dalton-Puffer, 2011), for example, when a language learner struggles to understand something while they are communicating with someone they employ various communication strategies to help them negotiate meaning. These strategies can involve paraphrasing, slowing down speech, asking for clarification or requesting or giving corrections and recasts. Several studies (Gass, Mackey and Pica, 1998; Ellis, 1999; Swain and Lapkin,

1998) found students' comprehension and lexis improving as a result of interaction. For example, In Swain and Lapkin's 1998 study, examining eighth-grade students in a French immersion classroom, they demonstrated how in the process of writing a story two students used language to both co-construct the language they needed and to co-construct their knowledge of this language. The interaction-rich environment of a CLIL classroom, more than an immersion one, could thus develop not only students' productive skills, but their knowledge and use of grammatical structures, in a more effective way than in either an immersion or a traditional language lesson.

Several studies have documented all-round improvements among students' language levels, measuring students' performance using established and objective methods such as Cambridge exams. Lasagabaster (2008) used the standardised Oxford Placement Test to measure students' grammar and listening skills, and found CLIL students outperforming the non-CLIL groups. Campo, Grisaleña and Alonso (2007) used University of Cambridge official exams to see how students' levels corresponded with the Common European Framework. Students participating in CLIL courses were significantly more likely to pass the exams than the control group (with 63% of CLIL students passing FCE (First Certificate in English) as opposed to just 13% from the control group). Moreover, Admiraal et al (2006) used the 'English as a Foreign Language Vocabulary Test' (EFL Vocabulary Test), developed by Meara (1992) to estimate the receptive English word knowledge of foreign language learners. Again, better language proficiency was noted in the target group. This use of standardised testing means that in these studies, researchers have been able to obtain objective data on a large number of students, assessing their skills as well as grammatical knowledge.

Research on the breadth and richness of students' vocabulary has been conducted using type/token ratios to assess not just the accuracy of lexical use, but the number of words being used, their length and whether they are using the most frequent, or more unusual and specific vocabulary.

Research shows that CLIL students' vocabulary is richer and more varied than control groups. In Jexenflicker and Dalton-Puffer's 2010 study of secondary students in Austria, CLIL students displayed richer and more varied vocabulary use in their writing task. Calculating quantitative ratios to determine the percentage of the 1000 and 2000 most frequent words (K1 and K1+K2) employed, the CLIL students used the most frequent words less often, demonstrated more variation in their lexis and used longer words. Moreover, CLIL students in Jiménez Catalán, Ruiz de Zarobe and Cenoz's 2006 study demonstrated richer and more mature use of lexis than non-content students although they speculated that CLIL had more effect on students' receptive than productive skills. Likewise, in Ruiz de Zarobe's 2008 study of Basque secondary students, the type/token ratio of their speech was studied to measure the productive vocabulary they used, showing CLIL students to display a slightly richer vocabulary than the control group. CLIL students are also less likely to borrow from their L1 and more likely to invent lexis (Celaya and Ruiz de Zarobe 2010), an activity more commonly found among higher level students (Navés, Miralpeix and Celaya, 2005).

Despite this, some studies suggest that there is little difference in word knowledge between CLIL and non CLIL students. Admiraal et al (2006) examined the receptive word knowledge of Dutch secondary school students participating in Bilingual Education programmes and found they did not learn new English words at a faster pace than the control group students, merely maintaining the advantage they already had.

2.4.2.1 Grammar

Studies suggest that CLIL students' grammar is more accurate (Jexenflicker and Dalton-Puffer, 2010, Ruiz de Zarobe, 2010) and uses more sophisticated structures (Llinares and Whittaker 2010) than students who have learnt a language through more conventional means. Jexenflicker and Dalton-Puffer (2010) studied 16-year old Austrian students at an upper-secondary engineering school. More than half of the CLIL students achieved the highest score of 'accurately' in their use of grammatical structures, whereas none of the non-CLIL students obtained this result. Ruiz de Zarobe (2010) also found CLIL groups performing speaking and writing tasks with more accuracy, particularly in terms of tense use.

CLIL students have also displayed more variety and sophistication in their use of language. Llinares and Whittaker's 2010 studied the speaking and writing skills of secondary students involved in a bilingual programme. They recorded students speaking in a teacher-led end of unit discussion, and set up a writing task a few days later which students were required to do in 20 minutes without any external support or materials. Using a systemic-functional approach they analysed linguistic features, such as semantic classes of verbs and linking of clauses, the ideational function of language in constructing content, and students' use of hypothesising and the use of modality. In the spoken data, the CLIL students used a greater variety of modal structures to express probability, obligation, etc. than the L1 students, though the authors accept this may have been due to the way questions were posed in the discussion.

2.4.2.2 Productive and receptive skills

Like Canadian immersion students before them, a disparity exists between CLIL students' strong reading and listening skills, and noticeably weaker speaking and writing (Jiménez Catalán, Ruiz de Zarobe and Cenoz, 2006; Ruiz de Zarobe 2007). In addition to this 'mismatch' (Ruiz de Zarobe 2010), results show that CLIL students evaluate themselves notably higher than students who had learnt English in language rather than CLIL classrooms (Dalton-Puffer, 2008).

Speaking

CLIL students' proficiency scores in speaking, when compared with EFL students are significantly higher. A number of studies have measured students' oral proficiency using established tests to measure a range of criteria, such as pronunciation, grammar, fluency and content. Admiraal et al (2006), for example, reported that the BE (Bilingual Education) group in his research on Dutch secondary school students scored higher than the control group in speaking proficiency and pronunciation using the Cito Oral Proficiency test. These improved results among the BE group can be partially explained by students' initial higher levels of English, exposure to the language and motivation to learn, but even accounting for this, the BE students still outperformed the other group.

Ruiz de Zarobe's 2008 longitudinal study of secondary school students in the Basque country assessed learners' speaking using the *Frog, where are you?* story (Mayer 1969) and categorised their speech production by pronunciation, vocabulary, grammar, fluency and content. The results showed that the CLIL students outperformed the control group in all of the scales. A significant difference between the CLIL groups and the non-CLIL groups in this study was the number of hours they completed. The CLIL groups had all participated in between 26% and 47% more English classroom time (whether in CLIL or in traditional English classes) than their non-CLIL peers. Therefore the improvements could be attributed to the number of hours spent in English-speaking surroundings, more than the CLIL classroom itself. Specifically, the areas where CLIL students show an advantage over their peers is in accuracy, (Ruiz de Zarobe, 2008), in risk-taking and showing fewer inhibitions (Dalton-Puffer, 2007), and more readiness to express their opinions (Llinares and Whittaker, 2010).

The reasons for CLIL students' success in speaking could be that CLIL favours an oral rather than written competence (Ruiz de Zarobe, 2010), with more emphasis in the lessons on communication. 'CLIL provides more opportunities for students to speak and to practise oral skills when using the target language as a tool in the classroom. This fact supports the view that communicative competence is acquired more successfully as a medium of communication and not as an end in itself.' (Ruiz de Zarobe 2010: 203) Furthermore, CLIL students have mostly had more exposure to English than their peers (Admiraal et al, 2006, Ruiz de Zarobe, 2008), although Admiraal et al's study factors this time advantage in, and still finds BE students outperforming the other group. As discussed earlier in this chapter, this time advantage has been questioned as not actually helping students. Torras et al (2006) found that neither starting language at a younger age or attending more hours of language lessons resulted in any significant benefit to language proficiency.

Writing

CLIL students' writing skills lag behind their oral competence (Ruiz de Zarobe, 2010), but they still outperform control group students' writing in tests that measure a range of features such as content, grammar, lexis and register (Lasagabaster, 2008; Llinares and Whittaker, 2010; Jexenflicker and Dalton-Puffer, 2010 and Ruiz de Zarobe, 2010). Research has shown CLIL students to use more accurate grammatical structures when they write (Zydatiß, 2007, as cited in Dalton-Puffer, 2011; Jexenflicker and Dalton-Puffer 2010). In Jexenflicker and Dalton-Puffer's research (2010) CLIL students surpassed the control group with their grammatical accuracy. This was also noted by Zydatiß (2007, as cited in Dalton-Puffer, 2011) investigating secondary school students in Berlin, although this grammatical strength is not matched by the students' ability to construct a logical argument.

CLIL students produce not only more accurate work, but more 'elaborate and complex' structures (Dalton-Puffer 2011). Zydatiß finds more wide-ranging and accurate use of lexis among CLIL students, a result that Ruiz de Zarobe (2010) also obtained in her analysis of Basque students' writing. In this latter study, CLIL students did better in the content and vocabulary aspects of the task. Despite this, Ruiz de Zarobe notes that the results in the written task are not as good as those achieved in the speaking tasks in her 2008 study with the same students. Ruiz de Zarobe's 2010 study is also interesting as it counters the notion that CLIL students perform better by virtue of the increased number of hours they spend learning English, since the students in the non CLIL group in the pre-University grade, and the CLIL group in the 3rd year of secondary education had similar hours of exposure to English (990 and 910 respectively).

CLIL students notably did better in their ability to build rapport through their writing. For example, in Jexenflicker and Dalton-Puffer's 2010 study comparing 16 year old Austrian students with those who had learnt English in traditional language classrooms, students were engaged in a free writing tasks to an imaginary host family in New York. The CLIL students outperformed the non-CLIL students in all aspects of the writing task, particularly in terms of register and rapport-building with the family.

In other research, CLIL students' written work has been compared with students writing in their L1. In Llinares and Whittaker's (2010) analysis of students' written work, they compared secondary school students in Madrid studying history in English on a British Council/Ministry of Education bilingual programme with students in the same schools learning the same subject matter in Spanish. They found that the L1 students displayed a greater awareness of the register of the discipline and used language that showed cause and manner as well as place and time. The CLIL students used more everyday language, though there was evidence that they were beginning to develop a history-specific vocabulary. For example, one student writes, 'The cities grow because of the <u>reactivation of trade</u>' (Llinares and Whittaker, 2010: 139). The CLIL students also displayed a wider variety of processes in their speech and writing, that expressed:

- identification: 'In Medieval rural areas the society <u>were</u> mostly peasants who could own their own small lands or be serfs and word the lands of noblemen and aristocazy (*sic*).'
- description: 'The consequences <u>were</u> that 5 million people died.'
- possession: '..peasants live in small houses... that only <u>have</u> one room'
(Llinares and Whittaker, 2010: 132)

Receptive skills

Established standard tests such as Cambridge exams (Campo et al, 2007) and the Oxford Placement Test (Lasagabaster, 2008) have found that CLIL students perform better than control groups in their receptive skills. Admiraal, Westhoff and de Bot's 2006 research, with Dutch bilingual students saw them achieve higher scores on the reading test than control group students, even taking into account the better entry level scores of students. Specific research in the listening skills of students attending lectures in English, in contrast with lectures in their L1, was undertaken by Hellekjær (2010), who studied University of Oslo students. Using a self-assessment questionnaire, learners were asked how easy they found it to understand the lectures in English, compared with those in their L1. Interestingly, a number of students (24%) had problems understanding lectures both in English and their L1, but 42% said they found the English-medium lectures more difficult than in L1. Students commented that the use of powerpoint slides was more important for understanding the English lectures than those in their L1, and 63% found studying in L2 was more laborious than studying in their L1. One of the greatest problems identified in the study, was not that students did not understand the vocabulary being used, but that the words were not clearly pronounced. A simple remedy, that Hellekjær identifies would be for lecturers to speak clearly and distinctly, and for lecturers to be screened for their proficiency in English.

In conclusion, the evidence that has been collected in recent years on language learning among CLIL students points to unqualified success in both their proficiency in the four skills, and their grammatical and lexical use. Despite this, finding directly comparable groups of students and teachers remains an issue. As discussed earlier, CLIL students, on the whole, display higher levels of proficiency and motivation than non-CLIL students. At the same time CLIL teachers, due to the challenge of the new approach, are likely to invest more time and effort into planning their lessons, though this advantage may be outweighed by the lack of materials available for their use.

2.4.2 Motivation

In chapter 6 of this thesis, we hear from the students involved in my study about how they felt about participating in a CLIL project and learning part of their curriculum in English. Student motivation has been highlighted by researchers, particularly in the field of second language acquisition, as important for successful learning outcomes. Language students with self-confidence, a positive self-image, high motivation, and a low level of anxiety are more likely to succeed according to Krashen (1981). On the other hand, low self-esteem, coupled with anxiety can raise a learner's 'affective filter' to form a 'mental block', preventing them from using comprehensible input for acquisition. Dörnyei (2007) suggests that 'long-term, sustained learning—such as the acquisition of an L2—cannot take place unless the educational context provides, in addition to cognitively adequate instructional practices, sufficient inspiration and enjoyment to build up continuing motivation in the learners' (*ibid*: 639). Teachers can create this enjoyable learning environment by establishing a healthy and cohesive group dynamic with a democratic and facilitative teaching style. Activities should be motivational and teachers should try to increase learners' self-confidence and help them to learn autonomously.

Advocates of CLIL have suggested that the very nature of the approach can reduce anxiety and establish motivation more effectively than traditional ESL, due to the presence of authentic subject matter and the absence of grammar. CLIL programmes, according to Marsh (2000) can nurture a 'feel good attitude' among youngsters who see that success is possible and 'the road towards improvement and development is truly open to them' (*ibid*: 7). CLIL by itself in any form does not automatically supply this, but CLIL designed as a collaborative, active and well-scaffolded environment can meet these criteria. In an EU-sponsored report calling for European-wide adoption of the approach, Muñoz (2002) asserts that in CLIL the affective filter of learners may be reduced due to the 'relatively anxiety-free environment' of the CLIL classroom. In addition, the motivation to learn subject matter through the foreign language 'may foster and sustain motivation towards learning the foreign language itself.' (*ibid*: 36)

Learner attitudes to CLIL programmes have received considerable attention in recent years in Spain, specifically in the Basque Country (Campo, Grisaleña and Alonso, 2007, Lasagabaster and Sierra, 2009), in Poland (Marsh, Zaja and Gozdawa-Golebiowska, 2008), in Austria (Dalton-Puffer, 2007) and in Malaysia (Yassin, Marsh, Eng Tek and Ying Yink, 2009). The range of contexts represented in the research enables us to see if similar themes emerge that are attributable to CLIL, and how the particular features of a region affect them.

In all of these studies, responses to questionnaires helped to draw a broad picture from a large number of students, while group interviews from a smaller sample generated more detailed answers. In all of the studies, students were involved in long-term bilingual or CLIL programmes and a high proportion of their lessons were taught in the target language.

Results from the Spanish, Polish and Austrian contexts were overwhelmingly positive. A common theme that emerged from the Polish and Basque research was that CLIL is more difficult, but worth the extra effort it requires (Marsh et al, 2008, Campo et al, 2007). As we saw in the performance evidence, CLIL pupils often outperformed their peers in how much content they learnt (e.g. Lasagabaster, 2008; Campo et al, 2007). Students also reported that CLIL made them feel they were broadening their horizons and developing intercultural competence (Marsh et al, 2008) and felt personally enriched by the experience (Campo et al, 2007). In the Spanish study in the Basque Country, students reported more positive feelings towards their native languages, Spanish and Basque, than students in the control group (Lasagabaster and Sierra, 2009). While in the Polish study, students felt motivated to learn additional languages (Marsh et al, 2008). The engineering students in Dalton-Puffer's 2009 Austrian study claimed their English had benefitted from CLIL, and they rated their abilities highly in all four skills, particularly reporting lower inhibitions in speaking the language. The EFL students in Lasagabaster and Sierra's (2009) control group reported more negative attitudes to English than CLIL students, describing learning the language as difficult and unappealing, which indicates that learning a foreign language the traditional way is harder and less enjoyable than with CLIL.

The only study that saw students making negative comments about CLIL, was Yassin et al's research on Malaysian students, which reported more negative attitudes towards learning science in English among students with low English proficiency (Yassin et al, 2009). In a follow up study in 2010, Yassin, Tek, Alimon, Baharan and Ying found that lessons were characterised by a high degree of teacher talk and low cognitive challenge. While teachers in the study had been trained in CLIL strategies and practice, Yassin et al reported that none of the teachers was implementing them. It is likely then, that the students in the first study were experiencing a very poor version of CLIL, which did not cater to their limited English skills. One reason for the positive feelings held by students in the Basque and Polish studies could be the feeling that they had been chosen to be part of something special. The Polish students were required to take a test to show their linguistic proficiency, while the Basque students were selected not only on the basis of their language, but also on the attitudes of the students and their parents, and their commitment to participate.

Both the Basque and Polish research looked at large-scale projects that were managed by regional departments of education, overseeing curriculum design, materials creation and teacher training. A great deal of resources and effort had gone into setting these bilingual and CLIL programmes up, with the hope that they would succeed and become a model that other schools would strive to emulate. No doubt, the teachers also felt they were part of something special and their enthusiasm for the project, coupled with their training, contributed to dynamic and motivating classrooms.

The amount of time students spent studying the L2 may also be a factor in fostering positive attitudes to CLIL and the language. In the Polish schools, students studied in English around 50% of the time, and in the plurilingual setting of the Basque country this rate was 25%, with students needing to study in three rather than two languages. Control group students, such as those in Lasagabaster and Sierra’s study, would only have been doing three hours a week of English, an amount of time which is unlikely to create competent speakers of an L2.

The negative results that came out of Yassin’s Malaysia study highlight the problems that can arise when teachers do not adapt their teaching style to the language levels of students. Far from creating positive feelings, these students felt stressed by their lack of linguistic knowledge and inability to understand the content of the lessons.

2.4.3 Process evidence

In the early years of CLIL, studies focused on learning outcomes using performance evidence such as exams and samples of students' written and oral output to measure how much students learnt. In recent years, research has increasingly been based on process evidence, through the recording and transcribing of discourse. This approach takes us right inside classrooms, revealing teaching in action. The moments of learning, and the events that lead up to them, are captured in the transcripts, giving us the opportunity to analyse the pedagogy behind them. This discourse-based approach is the main analytical tool used in this thesis.

2.4.3.1 Interaction patterns

Innovative, multi-modal and dialogic teaching practices have all been recommended for CLIL (e.g. Coyle et al, 2010, Mehisto and Lucietto, 2010 and Westhoff, 2004), so research into pedagogical practice in these classrooms would ideally reflect a move away from teacher monologues towards a student-centred and more interactive approach. Despite this, research points to classrooms dominated by teacher-fronted lessons and triadic dialogue. This may be a product of the data gathering process, something acknowledged by Dalton-Puffer (2007), with small group and pair interactions more difficult to record and transcribe. However, the fact remains that most classroom time is spent this way, despite calls for a more student-centred task-based approach (Nikula, Dalton-Puffer and Llinares, 2013).

An exception is found in Nikula's 2010 Finnish research, in which the teacher in the study engaged in fewer monologues in the CLIL lessons and took fewer speaking turns than students, suggesting a more varied and dialogic learning environment. Even when the teacher was lecturing in English, students interrupted him to make comments and ask questions, reminiscent more of a real-life conversation than a classroom. A key difference between Finland and the other countries included here for analysis is the high presence of English in everyday life (Llinares, Morton and Whittaker, 2012). In Austria and Switzerland, English has only a medium presence, and in Spain (with its dubbed TV and film and home-grown pop culture) it is even lower. The students in the study, Nikula speculates, due to their high English proficiency, may have shared the teacher's expertise in English, putting them on an equal footing with him and giving them more space to participate.

Finland, where students' English levels can rival their teachers' and where the educational approach emphasises equal, flexible and creative learning (Sahlberg, 2007) is perhaps a special case. Roles in the Spanish, Swiss and Austrian classrooms (Llinares and Whittaker, 2010, Badertscher and Bieri (2009, as cited in Breidback and Viebrock, 2012 and Dalton-Puffer, 2007) were much more traditional and interaction patterns more rigidly triadic. However, when teachers did shift the interaction pattern to pair or group work, a greater variety of speech functions appeared. To this end, Dalton-Puffer (2007), suggests CLIL teachers look to methods from ESP (English for Specific Purposes) to develop all four skills and encourage diversification of activities.

2.4.3.2 Discourse and content learning

While quantitative research on content learning outcomes in CLIL lessons tells us how well students learn a subject, it is through an examination of classroom discourse that we see the learning process in action. This rarely involves a seamless transfer of information from teacher to student (Dalton-Puffer, 2007), but a more dynamic and interactive process, in which meaning is negotiated. In fact Bonnet (2004, as cited in Breidbach and Viebrock, 2012) sees negotiation of meaning as a precondition for quality learning in a CLIL environment. This mostly occurs through teacher questions and student responses in the form of IRF (Initiation Response Feedback) exchanges.

Research into triadic dialogue and IRF (e.g. Dalton-Puffer, 2007; Schuitemaker-King, 2012) confirms the prevalence of the approach and reveals its advantages and shortcomings. The Initiation-Response-Feedback (IRF) sequence was first observed by Sinclair and Coulthard (1975) as the predominant feature of most classroom discourse. Since then, it has prevailed despite criticisms that it encourages too much teacher talk (the I and F moves are mostly reserved for the teacher) and promotes the overuse of display questions. Moreover, as stated earlier, the IRF framework, despite its flaws, makes for much more straightforward recording, transcribing and coding than group work, and without it seminal works such as Dalton-Puffer's analysis of Austrian classrooms would not exist. As well as the advantage to researchers, IRF is defended by Dalton-Puffer (2007) as being more common in everyday life than it might seem, being very similar to the interaction that occurs between primary care givers and children.

In her 2007 data, Dalton-Puffer shows how the F-move in Triadic Dialogue, where teachers evaluate students' answers, is central to the co-construction of knowledge. Teachers can use this move to accept or reject an answer, rephrase a response to make it linguistically or factually more correct (or clear), and also to expand or re-contextualise a student response. By using these techniques, teachers weave 'the instructional discourse into a coherent web' (Dalton-Puffer, 2007: 79)

The questions that a teacher asks impact directly on student output (Nikula et al, 2013). Questions can be divided into numerous typologies. Principally there is the distinction between display and referential questions (Mehan, 1979). Display questions, which the speaker already knows the answer to, are typical of teacher/student exchanges, though they have been criticised for lacking authenticity and not generating the type of student involvement that a referential question would elicit. However, as Dalton-Puffer (2007) points out, a teacher asking a student what colour they are going to use for a picture will only produce a one word answer, while if they ask for an explanation of why something happened they may encourage a longer answer. Questions are also divided into open (or divergent) and closed (or convergent) typologies (Barnes, 1969, as cited in Llinares et al, 2012). Open questions that start with 'what', 'why', 'who', etc. are more likely to generate an extended answer than one that can be answered with a simple 'yes' or 'no'.

Although it is a little crude to label questions in terms of good: referential and meta-cognitive and bad: display and for facts, most researchers seem disappointed when it is the latter group of questions that appear most commonly in their data (Menegale, 2011; Schuitemaker-King, 2012). Reasons for the preponderance of this type of question are cited as the need for teachers to get through the curriculum quickly (Menegale, 2011; Dalton-Puffer, 2007) and teachers' low proficiency in the L2, meaning they lack the confidence to ask questions which may veer away from the lesson plan and take them into unfamiliar linguistic territory (Dalton-Puffer, 2007).

Not all the studies saw a prevalence of closed display questions. In Dalton-Puffer's 2007 data, more referential than display questions (53%:47%) and more open than closed questions were asked (63%:37%), although questions for facts dominated (89%). In studies that compared content and language specialists some differences emerged. In

Pascual-Peña's data from Madrid (2010), the content teacher asked more open and referential questions for reasons and opinions, while the language teacher asked closed, display questions for facts, something that goes against Dalton-Puffer's claim that non-native teachers lack the confidence in their language to ask questions that may open up the floor to complex ideas. In Schuittemaker-King's data (2012), conversely, the English support teachers asked more challenging questions than the CLIL content teachers, who would most likely not have had knowledge of second language acquisition theories.

Student responses, regardless of whether they were open or closed or display or referential, were invariable of the short one-word variety. Even when teachers tried to use questions that would encourage long answers, students gave short ones in Dalton-Puffer's study (2007), which she speculates could be due to students' familiarity with the roles and conventions of triadic dialogue. Only when teachers asked for descriptions and explanations, were they able to elicit longer answers. In support of the tightly-structured triadic dialogue found in her data, Dalton-Puffer suggests that the short non-demanding nature of the 'R'-move gives students the confidence to contribute, and if longer and more complex answers were sought, students may contribute even less. Menegale (2011), however, thinks that there should be more variety of questions, and teachers should leave longer pauses to give students space to process the question and formulate an answer.

2.4.3.3 Discourse and language learning/the focus on form

CLIL in Europe is 'content-driven' (Llinares et al 2012) and almost exclusively taught by content specialists rather than language teachers. As a result, the development of language skills is often incidental rather than by design.

One way to track the progress of students' language learning is to identify incidences of negotiation of meaning (NoMs), which is the interaction between native and non-native speakers (or teachers and students) that helps overcome problems in communication (Llinares et al 2012). An information transfer model (Shannon and Weaver 1948, as cited in Dalton-Puffer 2007) would see meaning transferring seamlessly from one speaker to another but, more commonly, interlocutors interactively and continuously establish, expand and repair 'common ground' (Bonnet, 2004: 99, as cited in Schrönkhammer, 2012). The ability to successfully negotiate meaning is the key element of CLIL classrooms' (Bonnet, 2012: 73).

Research into ESL, immersion and CLIL classrooms have found NoMs to be less common than expected (Walsh, 2006; Mariotti, 2006; Musumeci,1996; Foster, 1998; Dalton-Puffer 2007). In Musumeci's content-based classrooms at the University of Illinois, negotiation of meaning was rare, and when it did occur, it was seen as 'tenacious and inappropriate' by both the teacher and fellow students (1996: 30). Negotiation, which should be seen as a linguistic issue, was revealed to be a social one. The teacher with the highest incidence of negotiation of meaning was evaluated least favourably in the end of course feedback, with students explaining they wanted teachers to be able to explain so well that clarification questions were unnecessary. In addition to being unusual, examples of negotiation of meaning are often far from interactive and communicative. A typical example is described by Mariotti (2006) who studied data from CLIL classrooms in Italy. Students would request clarification of lexis with a single word, and the teacher would provide a definition without attempting to encourage further output from the learner.

The lack of organic language learning in CLIL classrooms has led to calls for a more proactive approach to focusing on form (Lyster, 2007). Opinion varies on the extent to which language should be explicitly taught in a CLIL context. Coyle et al (2010) summarise the dilemma on incorporating a grammar focus.

> Students have to be able to use the vehicular language to learn content *other* than grammatical form otherwise this would not be CLIL. But the question remains: how can learners use a second or additional language for this purpose if they do not know how to use it?
>
> Coyle et al, 2010: 33

A solution, they suggest, is to view the integration of language and content as a 'continuum' (rather than a choice between two opposing ideals) and seek a 'balance' between the two. In much the same way, educators should seek a balance between meaning and form, rather than focussing on one or the other. (Coyle et al, 2010)

While keeping meaning and form as an integrated whole is a tenet of systemic functional linguistics, some researchers into Canadian immersion programmes have argued for differentiation between the two (Lyster, 2007; Swain, 2000). Lyster, in particular, favours negotiation of form rather than meaning, since meaning is more related to comprehension and social issues, and does little to encourage language learning. He suggests that teachers use proactive strategies to raise awareness of language in their lessons through tasks designed to get students using the target language. Moreover, he advocates the use of reactive strategies, such as recasts, repetitions and confirmation checks to respond to linguistic issues that arise in the course of a lesson (Lyster, 2007).

2.4.3.3.1 Proactive strategies

Since negotiation of meaning is not a strategy that language learners are inclined to use, Foster (1998) writes that teachers should develop tasks that provide participants with comprehensible input, generate comprehensible output and require an exchange of information. Even more explicitly, Lyster (2007) recommends embedding target language in tasks e.g. modals in a desert island scenario so students are clear on the language they need to be using, and Llinares et al (2012) suggest gap fills that check students understanding of grammar and content e.g. 'The Earth spins in a/an clockwise / anticlockwise direction.' (Excerpt from *Essential Geography and History 1*, 2008 reproduced in Llinares et al, 2012: 200)

There is, however, very little research to show proactive strategies in use. Perez-Vidal's (2007) study designed to look at form in CLIL classrooms in Catalonia, unfortunately found no examples of teachers focusing on form, while Vázquez Díaz (2010) found no explicit teaching of the grammar rules of articles in CLIL lessons. In spite of this, she noted that Spanish students' article use very slightly improved over a 2 year period. This improvement, she speculates, was probably due to learners' improved proficiency leading them to start applying article rules effectively (though she concedes that the students may have learnt about article use in their EFL lessons). The only slight improvement, however, leads her to lobby for more focus on form in CLIL lessons, which can address students' L1 transfer errors at an earlier time (rather than let them evolve over a 2 year period).

2.4.3.3.2 Reactive strategies

Earlier in this chapter we looked at how a lack of NoMs coupled with insufficient advances in L2 proficiency have led to calls for a more proactive approach to teaching form in CLIL classrooms. As we have seen, the use of proactive strategies has been very thin on the ground, which brings us back to reactive strategies that can be employed by teachers in a bid to enhance language proficiency among students.

Instances of repair in Dalton-Puffer's Austrian classrooms (2007) ran at about 1 every 2 minutes, or 27 times per lesson, and an average of 60% of errors were followed by teacher repair. This matches Lyster's rate of 60% of error correction (1998), but within Dalton-Puffer's classrooms the correction rate varies between 9% and 92%, leading her to comment that the number of instances of correction is less important that the context in which they take place and the rationale behind a teacher's decision to correct or not. She noted that teachers repair less when they are team-teaching and when students take longer turns e.g. when they are presenting. When one teacher is leading students in lock-step, repair is much more frequent. Moreover, younger students are corrected more than older ones, something that is also evident in Lyster's data.

Interestingly, in Dalton-Puffer's study, it is content rather than language teachers who claim they do not hesitate to correct errors such as the third person singular *-s.* In practice, though, it is the EFL teachers who correct more than the content teachers. The errors most consistently corrected are vocabulary and pronunciation-related, perhaps because they require only a simple correction, and no further explanation of why. The data on correction in this study support this finding. In most cases in the Austrian data (55%), students self-repair, which Dalton-Puffer argues, mirrors everyday conversation. Where repair is interactive (involving a peer or the teacher), it most commonly relates to facts or ideas, or the vocabulary associated with them (whether its meaning or pronunciation). Grammatical errors are very rarely dealt with in Dalton-Puffer's data.

In Lyster's Canadian classrooms (1998), teachers were more likely to correct grammatical and phonological errors. Reasons for this difference, Dalton-Puffer suggests, may be the structural differences between the languages or the number of errors actually made, which would result in fewer corrections. Moreover she wonders if cultural differences may be a factor, with questions of grammatical inaccuracy either unimportant or taboo in Austria. Likewise phonological problems are ignored in Lyster's immersion classrooms, something which may be a taboo subject in Canada.

Comparing CLIL lessons with EFL settings enables us to see the types of things that CLIL teachers focus on when they correct, as well as the rate of correction. Incidences of repair in European CLIL contexts tend be lower than in EFL classrooms, and EFL teachers are more likely to invite self-repair while CLIL teachers correct students directly (Lochtmann, 2007, as cited in Dalton-Puffer, 2011). This difference reflects the priorities of the two lesson types: of correct form in language classes and pragmatic meaning in CLIL.

2.5 Impact of the literature on this study

Different strands of this literature review fed into my study both substantively and methodologically. For example, by examining approaches to CLIL methodology (Coyle's 4Cs Framework (1999), Mehisto and Lucietto's CLIL essentials (2010) and Meyer's CLIL core elements (2010)), I developed a clear sense of what I considered to be good practice in CLIL classrooms. This helped me in my curriculum and task analysis and enabled me to critically evaluate the lessons I observed and recorded.

In terms of choosing the approach for my study, I noticed that many studies in Spain had focused on performance evidence, collecting data on language and content learning outcomes (e.g. Ruiz de Zarobe, 2008, Lasagabaster, 2008 and Campo, Grisaleña and Alonso, 2007. Shortly after completing my initial study (see chapter 4), which was an attempt to collect performance evidence, I read Dalton-Puffer's 2007 account of Austrian classrooms. By reading the lesson transcripts, for the first time I could see what was taking place in a CLIL classroom that I had not observed myself. As a result, I decided to adopt a similar approach for my main study and focus on collecting process evidence by recording and transcribing the classroom discourse of both CLIL and L1 subject lessons.

2.6 Conclusion

In this chapter, we have seen the importance of three main strands of pedagogy that have shaped CLIL: socio-cultural, socio-constructivist perspectives, Canadian Immersion education and communicative language teaching. Research into CLIL programmes is almost entirely positive in its findings on language learning, content learning and motivation. While this is a great endorsement of CLIL, and should ensure funding for projects and training for years to come, I was concerned about some issues in the selection of students. In several studies, particularly in Spain, students were chosen to participate in CLIL research studies based on their already high English proficiency, their motivation to learn and their and their parents' commitment (e.g. Lasagabaster, 2008, Campo et al, 2007 and Lasabaster and Sierra, 2009). I worried that this might involve teachers selecting not only the most able pupils, but also those from middle class Spanish (rather than immigrant) backgrounds. As I have already discussed, successive governments in Spain have supported CLIL and seen it as a solution to the problem of low English proficiency rates among school students. Since this problem mostly affects children who do not attend private English academies, I would argue that students of all abilities and backgrounds should have been invited to participate in studies to get a truer picture of the effectiveness of CLIL.

More nuanced findings appear in the process evidence, however. We see a predominance of IRF interaction patterns and less multi modality that we might hope to find (Dalton-Puffer, 2007; Nikula et al, 2013). Low levels of student participation (Dalton-Puffer, 2007; Menegale 2011) seem the norm, which perhaps will continue to be the case until pupils' English levels improve and teachers adopt a more communicative and scaffolded approach with time allocated for speaking. Moreover, the low incidence of NoMs suggests that a more proactive approach to focussing on form may be needed to elevate the language component of CLIL to the same status as content.

Chapter 3. Methodology

3.1. Introduction

The purpose of this research project is to examine the effectiveness of teaching science content in English to secondary school students in Catalonia. In this chapter, I will present the research methods employed in this study and the reasons for choosing them. I will also describe the procedures for gathering and analysing the data and provide details on the setting for the project: the schools, the teachers and the students. I hope that by setting out my research methods and procedures in this way, the validity of the results can be assessed by the reader, and that other researchers working in the same field can replicate the study.

3.2. Background

I conducted an initial study in the academic year 2007-2008 and collected mostly affective evidence to find out about students' learning experiences and perceived learning outcomes. In addition, I collated their exam results and the marks they were awarded by teachers at the end of term to assess their academic performance. The comments made by students in the questionnaire and interviews showed that students adapted well to their new learning environment. However, the exam results and teacher-awarded marks did not provide any real evidence of improved English levels or understanding of the content taught. As a result, for the main study, which took place in the academic year 2008-2009, I wanted to use methods that would provide detailed information on how much students were learning and the factors influencing their learning outcomes. Finally, I conducted a follow-up study in the academic year 2011-2012, when I interviewed one of the teachers from the main study and distributed questionnaires to some of the pupils who had taken part in those lessons.

3.3 Research paradigm

In my research, I opted for an interpretivist rather than a positivist paradigm, using mainly qualitative rather than quantitative methods (see figure 3.1). I also followed a naturalistic approach in the way my research methods evolved as the project progressed. As a result, I used some research instruments that collected numerical data, and so there is also a multi-method dimension to my approach.

3.3.1 Positivism or Interpretivism?

Positivism is a deterministic and empiricist view of the world and was the principal paradigm in social science in the mid-20th century. It aims to understand the world by observing and measuring phenomena in a scientific way based on empirical enquiry. This data could then predict relationships between variables (Mackenzie and Knipe, 2006). Positivism, when applied to social science, assumes social phenomena can be treated in the same way as natural phenomena and measured quantifiably. Positivists saw both the natural and social worlds as existing within the same 'strict set of laws' (Gray, 2004: 18).

However, a fundamental problem with positivism, when applied to social rather than natural science, is that social science deals with values as well as facts. Understanding is therefore prejudiced because it cannot be separated from the individual and the event (Cousin, 2005). This is particularly true in the context of classrooms, where the order of the natural world clashes with human nature in all its complexity. As a result, as Cohen et al argue, attempting a positivist approach in a classroom presents the researcher with 'a mammoth challenge' (Cohen, Manion and Morrison, 2007: 11).

Interpretivism is a reaction to positivism that accepts the difference between natural reality (science) and social reality, and the need to adopt a distinct method to study the social world (Gray, 2004). Within the interpretivist paradigm, we can find the naturalistic paradigm, which views the world as numerous constructed realities. Each reality is so different from the next that they must be studied holistically (Lincoln and Guba, 1985). While understanding can be gleaned from studying these realities, there is no point trying to extract conclusions that can be applied to other realities. Using a naturalistic approach involves taking a flexible approach to research design. Instead of setting out a clear plan of how a research project is going to take shape, research designs can 'unroll' or 'cascade' during the process (*ibid*). This is the approach that I have most closely used throughout my project.

Some studies into CLIL, have undertaken to compare large numbers of pupils learning CLIL and English and compared their test results in an attempt to show the effectiveness (or not) of CLIL as an alternative to traditional ELT (English Language Teaching) on both language learning and content learning outcomes (e.g. Lasagabaster, 2008 and Campo et al, 2007). From a practical point of view, I did not have access to a large sample of pupils. I had access to three schools teaching CLIL to around 90 pupils. As I explain later in this chapter, these two schools could not have been more different in their socio-economic and cultural makeup. Therefore, regardless of the test scores these students might achieve, they would only describe the scores in these schools and not apply to schools in other parts of Catalonia or Spain.

In addition to this, there is the issue of what I would compare in terms of content learning objectives. If the students were learning the same topic in both languages, the data would not show anything, as they would not really be learning new content through the target language. On the other hand, if they were learning different topics in English and their L1, then they may be too different to accurately compare. These two scenarios are so fraught with problems that the research would almost certainly be flawed. Therefore, undertaking a large and statistical research project would be problematic on a practical level. There is also the question of what I wanted to find out, which was 'how' pupils learn in CLIL classrooms as much as 'how much' they learn. Since this would be difficult to measure quantitatively, the best route for my project would be to look in depth at a smaller sample and their learning processes through observation, transcription and interview. As a result, I have used a more open-ended exploratory research method based on an interpretivist paradigm.

3.3.2 Mixed methods

In addition to the mainly qualitative nature of my research, some of my tools were quite quantitative in the data they collected, the way I analysed these data, and the conclusions I draw from them. Rather than setting out to use a mixed-methods approach, my naturalistic approach meant that I chose each research tool on the basis of how effectively it would answer the research questions. By studying the data from more than one standpoint and using both quantitative and qualitative methods, I sought to fully investigate the complexity of the subject matter (Robson, 2011). The quantitative data gathered by coding lesson transcripts enabled me to draw general conclusions on the differences between English and Catalan language science classes, while the survey findings provided data that gave me the opportunity to compare the learning experience among different types of learners. The qualitative data I collected in the interviews and open questions helped me flesh out some of these generalisations with the pupils' and teachers' own observations and insights. Moreover, it was the qualitative analysis of the lesson transcripts that revealed concrete instances of learning that took place.

Using a mixed methods approach has been criticised by Silverman (2009) who suggests it is positivistic (so not suitable for a social study), while Patton (1980) observes that even having multiple data sources does not ensure consistency or replication. These criticisms exist within the paradigm crisis (Kuhn, 1970) that has raged in the academic world in previous decades, with researchers divided into either a positivist or interpretivist camp, and with those using multiple methods operating outside them, at risk of being eschewed by both. Some academics (e.g. Lincoln and Guba, 1981) claim that researchers always work within one of the two paradigms and that working outside one of the two paradigms is futile. While others (Newman and Benz, 1998) think that the two paradigms can coexist and the emphasis on separating the two approaches is artificial. Goodwin and Goodwin (1996) show how the similarities between the paradigms can make them compatible in that they both create knowledge and are vigorous, and that the two approaches can inform and assist the other. Robson (2011) showed that data can be gathered in one paradigm and analysed using a different approach.

An advantage of using a variety of methods is that it enables triangulation to be used. Easterby-Smith, Thorpe and Lowe (1991) refer to data triangulation as the collecting of data over different times or from different sources. Methodological triangulation is also possible with the use of a combination of methods such questionnaires and interviews. They point out that since all methods have their strengths and weakness, using multiple methods helps offset any weaknesses with the other data collection method. In addition, triangulation reduces the reliance on one method. It can demonstrate the validity of a piece of research by showing that the same conclusions can be drawn by looking at the subject through a variety of lenses. Having all the data collected from one source can bias or distort the picture (Lin, 1976, as cited in Gray, 2004), something that is less likely to occur when a researcher adopts a wide range of research tools.

In the end, my choice of research paradigm and tools was dictated by the questions I wanted to ask about how learners experience CLIL classrooms and the research I was able to conduct, given that I am researcher working alone with access to just three schools.

3.3.3 Positionality

An important issue for this study is how my own positionality might have influenced the research. In conducting research, it is necessary for researchers to take into account their own position in relation to both the research participants and the setting (McDowell, 1992). In this way, by identifying and presenting their positionality, researchers are able to self-identify their place and position within their field of study and define their viewpoint (Throne, 2013). Rather than aiming to exclude bias, Jones (2001) argues that it should be identified and declared.

My background as an English woman working as an English teacher in Catalonia, while studying for a PhD has inevitably shaped my views on issues relevant to this study, such as English language teaching and the Catalan education system. I moved to Barcelona in 2001 after spending seven years working in publishing and advertising in London. Very soon after arriving in Barcelona, I felt confident that I had made the right decision to switch careers and become an English teacher. I enjoyed working with young learners and was committed to the idea that through education and learning, young people could achieve their goals. However, I was frustrated about the unfairness I perceived in the Spanish education system, which I felt was letting down young people and limiting their future prospects. I felt angry that a two-tier system had been able to develop in terms of English language teaching. Children from poorer and immigrant backgrounds were particularly affected, and were not getting access to the private tuition that had become standard for wealthy and middle class Catalan families. In addition to the inequalities in the education system, I had doubts about the pedagogical approach used in mainstream schools, particularly in regards to English teaching. This was due to reports I had heard from my students, who told me that teachers rarely used English in English lessons and did not encourage students to practise what they had learnt.

I acknowledge that these views will have created problems for me as a researcher. To counterbalance some of the inevitable problems of my position, I tried not to let my preconceptions of CLIL and English language learning influence the questions I asked in interviews and questionnaires. I did this by giving participants the chance to tell me about their learning experience in their own words and making the questionnaire anonymous.

Furthermore, I think that by using lesson transcripts and applying a set of codes to them, I was able to focus on the learning process rather than outcomes.

In the initial study, I had designed and taught the lessons and knew some of the students well since I had been their English teacher. I wanted the course to succeed to validate my own teaching methods and strategies, and it was difficult for me to be subjective and separate my roles as teacher and researcher. By changing my role in the main study, and leaving most of the course design and teaching to the subject teachers, I found it easier to develop my role as a researcher. As a teacher, I still wanted to see the students successfully learn what they were being taught and the teachers to achieve their learning outcomes. However, I was able to shift the focus from myself and look more at what usually takes place in schools in Catalonia.

While the work of qualitative researchers is inevitably guided by their world view (Creswell, 1998), I hope that by presenting my own position in an honest and transparent way in this section that I have demonstrated an awareness of how my position has affected my role as a researcher.

3.3.4 Ethical considerations

A key issue in ethical considerations is not just getting the consent of participants, but obtaining their informed consent (Gray, 2004). I did not want any of the teachers in the study to feel like they had been cajoled into participating in the research or to be surprised by any aspect of it, so I took steps to explain to them what the aims of the research were, what data I was planning to collect and how much of their time I thought I would need.

I already knew the school in the initial study because I was working there as an *extraescolar* English teacher through a private academy. To get access to a classroom, I first discussed the matter with the director of my language academy, who put me in touch with the school's head of ESO (*Educación Secundaria Obligatoria*). I contacted her by email and explained that I would like to teach a 30-hour geography course in English to some of the secondary students at the school as part of my PhD, and also collect data in the form of questionnaires, interviews and exam results. She approved my request and put me in touch with Juan, who had begun teaching geography in English that academic year to 3rd of ESO students. After sending him an email in which I detailed what I hoped to get out of the course, we had an initial meeting on 26 October 2007. We discussed how he was finding the course so far and we chose the units that I would teach. We also agreed what our roles would be in the classroom and decided that I would teach the lessons and Juan would have more of a teaching assistant role. We then set up a time for me to observe Juan teaching his students, so I could get to know them before I started teaching them myself.

The process for getting access to classrooms in the main study was very similar. I first approached Maria by email introducing myself and explaining what I was hoping to get out of the study. I then met with Maria and Belén on 24 November 2008 to discuss the format of the course and what our roles would be before getting access to their classrooms. In this first meeting with Maria, she told me about Albert and his project in El Raval. As a result, I contacted him by email and met him on 30 January 2009. Shortly afterwards I began to observe his lessons.

At these initial meetings, we discussed the procedure for obtaining parental consent. All three schools sent out and collected the consent forms on my behalf. Throughout both projects I maintained regular email contact with all of the teachers and we generally had time to meet before and after lessons to discuss how the course was going and address any issues that had come up. In line with the procedures recommended by the University of Nottingham, I followed BERA research ethics guidelines (BERA, 2004) and assured all participants that the use of their data would be confidential and that their identities would remain anonymous. I told them that they could withdraw from the project at any point without penalty or negative implications.

Both the initial and the main studies involved observing, recording and questioning students between the ages of 12 and 15, and I made an effort to ensure they were comfortable with their role as participants. To begin with, I went to each of their classrooms as an observer and was introduced to them by their teacher. I explained that I was an English teacher and told them a little about my project and the information I planned to collect. From the outset, I made an effort to get to know students and develop a good rapport with them.

The names of the teacher and students involved in the project have been changed, and a consent form (see Appendix 1) was signed by the parents of participating students to gain permission to record lessons and involve learners in interviews and completing questionnaires. At each stage of the research process, the students and the teacher were reminded that their names would be changed in the final thesis.

Implications of being a participant observer

In both studies, I was a participant observer. Although I was transparent about my objectives as a researcher, I took on a familiar role as a teacher and teaching assistant. As a result, the student participants for the most part behaved as they normally would in class, particularly as time progressed. In addition, the teachers regarded me as a colleague as much as an observer. This resulted in them teaching in an unselfconscious way, and also meant that they were happy to confide in me. Bailey (1994, as cited in Cohen et al, 2007) makes the point that researchers in observation studies can note ongoing behaviour as it happens and develop close and informal relationships with their participants. In my initial study in particular, because I was teaching the students, marking their work and reading their learner evaluations, I got to know them very well. In fact, being so close to them meant that I experienced the same highs and lows as I did in my professional life as a teacher. So, when they participated well and produced high-quality work, I felt proud of them. Conversely, I was disappointed when a lesson did not seem to go well or when a student performed poorly in an exam.

Gray (2004) identifies the challenge in participant observation of maintaining a balance between being an insider and an outsider. While researchers need to get emotionally close to their subjects, they also need to have a professional distance from them. In my initial study, I was concerned that the balance was too much in favour of being an insider. However, in my main study I felt that I was better able to manage this balance, since I had less of a vested interest in the success of the course.

3.4 Initial study

3.4.1 Research questions

The initial study was my first experience of observing CLIL in action, and I sought broad answers on whether the students' English improved, if they had been able to learn the subject matter in English, and how they had adapted to the communicative and task-based approach of the course.

The questions I asked and the research instruments I used are outlined in table 3.1 below.

Table 3.1: Research questions and instruments in the initial study

Study	Questions	Research instruments
Initial	1. Did pupils' English levels improve? 2. Were pupils able to cover as much material and learn as effectively in English as they would have done in their L1? 3. How did pupils adapt to a more communicative and task-based approach to learning?	Pupils' marks for English from the autumn and spring terms. Pupils' marks for geography from the autumn and spring terms. Exam results from halfway through the term and the end of the term. Learner questionnaires Learner interviews Learner evaluations Recordings of student debates

3.4.2 Participants

3.4.2.1 Sampling

I had already been teaching English at the school in Clot, the subject of my initial study, for three years, giving *extraescolar* classes to secondary pupils in the evenings after school. As a result, I was able to approach academic and management staff when I found out that they were running a CLIL programme, and I asked if I could get involved by helping to teach some lessons, and collect data on pupils' learning experiences. I already knew some of the students in Juan's 3rd of ESO geography group as I had taught them English when they were in 1st of ESO. This meant pupils were happy to accept me as both a teacher and a researcher, and I always found pupils very eager to complete questionnaires and volunteer for interviews.

In the initial study, 29 students participated in the research project, in terms of attending lessons and submitting work to be evaluated. A smaller number were involved in other aspects of the research, for example, in questionnaires, interviews and providing self-evaluations (see table 3.2).

Table 3.2: Participation in the initial study.

	Number of students	Participation in questionnaires	Participation in interviews	Participation in first self evaluation	Participation in second self evaluation
Juan's group in Clot	29	11	6	19	11

3.4.2.2 The school

The initial study took place in a mixed public/private (*concertada*) school in a mostly Catalan neighbourhood called Clot, near the centre of Barcelona. Around 30% of children in Spain attend *concertada* schools, which cost parents between 250 and 700 euros a month. These schools are perceived as stricter and are often connected to a branch of the Catholic Church. Unusually for Barcelona (where 15% of school age students come from immigrant families (*Institut d'Estadística de Catalunya*, 2007), all pupils involved in the study came from Catalan or Spanish families and were bilingual in the two languages. The school took pupils from *infantil* (from 3 years) up until *bachillerato* (until 18 years), and in total had more than 2,000 pupils. Despite being privately funded, its urban setting gave the school a crowded feel, and the only outside space was a paved roof terrace. Also, class sizes were quite large (29 in each group) and there was no requirement for teachers to have passed the civil service exam for teachers (*oposiciones*).

3.4.2.3 Students

In the initial study, 29 students between the ages of 14 and 15 took part in the study. They were selected to study geography in English rather than in Catalan on the basis of their high level of English. Social science is not usually streamed and students study with their tutor group. However the learners in this group were in the top set (of four) for English and were thus chosen by the head of year to participate in the CLIL programme. At the end of the academic year in which this study took place, some of the pupils in the group passed the Cambridge PET (Preliminary English Test) exam, which demonstrates they had a B1 level of English.

3.4.2.4 The teacher

In the initial study, the CLIL project was organised and taught by Juan, a teacher with ten years experience teaching geography in Catalan. Juan had a B2 CEF (Common European Framework) level of English and was enthusiastic about the possibilities of teaching geography in English, although he had not received any training in CLIL. Unlike the teachers in the main study, Juan was not *oposiciones* qualified, since this is not a prerequisite for teaching at the school.

3.4.3 Research methods and procedure

3.4.3.1 Interviews

In the initial study, I interviewed six students in May 2008 (two months after the course had finished) and asked them about their learning experience. Research questions were prepared for these semi-structured interviews (see Appendix 3), however the last few minutes of each interview were kept for any other issues that came up during the interview. The six students were chosen for interviews on the basis of the completeness of their data set. They had each completed the evaluations and the questionnaire, and had submitted written work. This commitment to completing the work required would suggest an enthusiasm on the part of the students for the course. However, their comments and overall marks show they had widely ranging attitudes towards the course, and performed with varying degrees of success in the exams and end of course assessments (see tables 4.1 and 4.2).

3.4.3.2 Questionnaires

In the initial study, I gave students a questionnaire to complete (which they could answer anonymously if they wished) asking them to rate their learning experience and their views on the methods and materials used (see Appendix 2). 11 learners out of 29 answered questionnaires. Of these, eight wrote their names on the form, but three chose to be anonymous.

3.4.3.3 Recorded dialogue

In the initial study, I recorded students while they were participating in a debate on immigration and refugees (see Appendix 5). During this lesson, pupils were working on a task in groups of three or four and I put a handheld voice recorder on the table next to them, briefly interrupting them to point out that they were being recorded. In total, I recorded five groups speaking for around 10 minutes each. Most of the dialogue was in English, and I transcribed everything the students said in order to see how well students performed the task, if they had used the useful language I had given them and how much and when they used their L1. This was the first time I had used recorded and transcribed dialogue, and I did not attempt to code the discourse in any way. Neither Juan nor myself appeared in these transcripts.

3.4.3.4 School reports, pupil evaluations and case studies

In the initial study, in which my focus was more on learning outcomes than learning processes, I also gathered pupils' exam results. The exams were entirely in English and tested the content covered in class and in the glossaries. The format for the exams was the same for students studying the content in English and those studying in Catalan, and included multiple-choice questions, gap-fills and short essay questions. After the first exam on globalisation, some students were worried that they were not prepared enough, so before the second exam on the organisation of space, a 55-minute class was devoted to revision. The first exam was given at five weeks and the second at nine weeks. I also collected the marks that pupils were given by their English teacher in their Christmas and Easter reports. The marks are awarded out of ten and combined the end of term exam, project work and the teachers' perception of each student's attitude. In addition, I collected the marks that Juan gave pupils. These were calculated in the same way as for English, and were based on pupils’ overall performance in the content subject.

Pupils in the initial study wrote evaluations of the course at three weeks and seven weeks, in response to questions posed by the teacher (see Appendix 4). Students were asked to choose a nickname (English or otherwise) for anonymity reasons for their ‘diary’ and responded to the challenge with names such as ‘Moxye crazy pink’, ‘Typpex’ and ‘Shadow’. 19 students completed a first evaluation at three weeks, and 11 completed a second one at 7 weeks. Based on all of the data I collected during the project, I created case studies for six students. I chose these students on the basis that I had a complete set of data for each one: written evaluation, questionnaire, recorded interview. I also used samples of their written and spoken work and their exam grades to compile the case studies.

3.4.3.5 Course design

The course took place over 30 55-minute lessons between January and Easter of 2008. I taught the lessons, but Juan was always present, and helped with classroom management, monitoring and the occasional translation. Most lessons took place in the regular social sciences classroom (a room with a blackboard, a teacher's desk, and 35 single desks arranged in rows and facing the board). A computer room with enough computers for each student, and a lecture theatre with a projector were also available and used on occasion.

Over the course of the academic year, all 3rd of ESO students in Catalonia study a 16-unit course in geography, which includes modules on international economics and politics and a final section called 'Transformation and inequality in the world today'. We chose this part of the course as the content for the study, despite being situated at the end of the textbook, because the head of year and I agreed it would be good subject matter for a native English teacher due to its international flavour.

All the students were using a geography textbook in Catalan, which I used as the basis for my classes. As much as possible, I tried to use Do Coyle's 4Cs framework (1999) as the basis for my lesson plans. The emphasis of these classes was on communication, and students worked mostly in pairs and groups. Tasks included fact-finding reading galleries, webquests, map and chart activities (for example, where students have to compare data such as birth rates and population growth), role-plays and discussions (see Appendix 5). I designed activities, which I hoped would engage and motivate students and encourage speaking. I used glossaries, useful language sheets and speaking frames to support learners. I presented examples of target language as the need arose, but I did not explicitly teach any grammar. I tried to pay attention to learner responses to different class types and the format evolved over the 30 hours to reflect what had worked and what had not. For example, after the success of the first webquest activity, at about the half-way point, I used this format on a regular basis.

3.5 Main and follow-up studies

3.5.1 Research questions

For the main study, I wanted to ask more specific questions about the nature of the learning that took place. I took it as given that students' English levels would probably improve over the year (they also did three hours of English class a week on top of CLIL science), and this time I chose to focus on their learning of the content.

When I went to the school in La Garriga in October 2008 for my initial meetings with Maria and Belén, they shared their views with me on how their CLIL lessons had been going, and how they thought their teaching methods and pupils' learning outcomes had been affected by the use of English rather than Catalan as the language of instruction. In table 3.3, I outline the views they expressed, and in the column on the right, I look at them from a researcher's position, thinking about what these comments might signal and what CLIL classrooms could be like.

Table 3.3: Teacher and researcher positions

Teacher views	**Researcher position**
Student engagement and participation is lower in the CLIL classrooms. Students ask fewer questions and provide short answers.	A 'monologic' rather than 'dialogic discourse' (Nathan, Kim and Grant, 2009) may be taking place in CLIL classrooms with students contributing less to the construction of knowledge than they do in the L1 environments.

Students do not understand as much in the CLIL lessons, so the pace of lessons is much slower, and the content is not taught in as much depth.	In CLIL lessons, students are taught the same information repeatedly in a variety of ways (IRF, experiments, worksheets, etc.). This could mean that teachers are unable to go into the same level of depth as they do in the L1 lessons. On the other hand, this strategy could be effective in helping students understand key concepts and suit some learners better than a more dialogic approach, in which higher level theories are explored, but some students are left behind.
The content in the CLIL lessons is taught in a variety of ways, which seemed to help students grasp key concepts.	The highly-scaffolded nature of the CLIL lessons (in contrast with the L1 lesson, which contain fewer stages and types of activities) could contribute to improved learning outcomes.
L1 is used in CLIL lessons to ensure all students are following the lesson.	Is L1 the best/only way to teach content to students with low levels of English? How can teachers know if students are understanding and how can the content be recast for the benefit of all without using L1?

Using these teacher and researcher views as a starting point, I chose the following research questions for the main study:

1. How was the spoken interaction in the L1 and the CLIL lessons different? Was one lesson type more monologic or dialogic?
2. What strategies did teachers use to scaffold learning in the CLIL lessons? How did learners benefit from these strategies.
3. What methods did teachers employ to overcome problems of understanding without using L1?

In the follow-up study, I wanted to know how Maria, the main teacher in the study, was getting on with her CLIL practice, and I also wanted to ask some of her pupils, now in *bachillerato* (sixth form), about their attitudes to learning science and English.

In table 3.4, I present the research questions and instruments for the main and follow-up stages of the study.

Table 3.4: Research questions and instruments in the main and follow-up studies

Study	Questions	Research instruments
Main	1. How was the spoken interaction in the L1 and the CLIL lessons different? Was one lesson type more monologic or dialogic? 2. What strategies did teachers use to scaffold learning in the CLIL lessons? How did learners benefit from these strategies? 3. What methods did teachers employ to overcome problems of understanding without using L1?	Discourse analysis of lesson transcripts using SETT (Self Evaluation of Teacher-Talk) Framework (Walsh, 2006) and my own coding. Teacher interviews Learner interviews Learner questionnaires Observation of lessons Curriculum/task (content) analysis
Follow-up	1. How has Maria's CLIL teaching developed since the main study? 2. What is the attitude towards CLIL of some of the pupils who participated in the main study?	Teacher interview Learner questionnaires

3.5.2 Participants

3.5.2.1 Sampling

There are dozens of schools in Catalonia teaching CLIL. However, for my main study, I wanted access to classrooms that met the following criteria:

- Groups of students learning similar subject matter both in English and their L1.
- Groups of students of the same age and learning similar subject matter across more than one school.
- Teachers who were open to being observed and recorded.
- Teachers who were open to suggestions about their materials and teaching techniques.
- Schools that gave me access to their classrooms and helped me get written permission from parents to do my research.

- 'Typical schools' i.e. state or partly state-funded (*concertada*) schools following a standard curriculum.

3.5.2.2 Recruiting participants

I found my participating schools through existing contacts. The *enchufe* system is widespread in Spain. To be *enchufado* means to be plugged in, and involves friends and relatives doing each other favours to set up jobs, contracts, loans, etc. (Faiella, 2004).

I found Maria through a colleague of a friend who had just started working as the English-language teaching assistant at the school in La Garriga. Maria in turn introduced me to Belén (who also works in La Garriga), and, through another contact, she put me in touch with Albert (the teacher in El Raval).

Maria had participated in a CLIL programme at the University of Nottingham with Do Coyle and Philip Hood, which meant she could relate to the ideas behind the research project. She gave me access to as many of her classes as I wanted to observe, including those she gave in Catalan and to other age groups. In return, I helped proofread and correct materials, and took on an unpaid teaching assistant role in her classes, helping students with vocabulary questions and facilitating experiments. Maria's enthusiasm for the project no doubt helped students accept my presence in the classroom, and they soon became used to me and my voice recorder, either sat observing on the side lines, or monitoring during tasks.

Although I spent less time at Albert's school in El Raval, he was also enthusiastic about being involved in the project, and my role in his lessons was similar, monitoring students during activities and answering any questions they had.

In all, there were two participating schools with 71 2nd of ESO students learning science through English in three distinct groups each led by a different teacher (see table 3.5). Five pupils from the main study, in addition, participated in the follow-up study in 2012, alongside five pupils who were studying in the same 1st of *bachillerato* science group, but had not been part of the original research.

Table 3.5: Teacher and student participants

Phase	Schools	Students	Teachers	Teaching assistants	No. of groups
Main study (2008-9)	2	71	3	2	3
Participation in recorded lessons (main study)	2	71	3	2	3
Participation in questionnaires (main study)	2	28	0	0	n/a
Follow up study (2011-12)	1	10	1	0	1

Not all of them were involved in all aspects of the study (see table 3.6). Belén's group in La Garriga did not participate in either the interviews or the questionnaires. Furthermore, only the students who attended on the day of the interviews from Albert's and Maria's groups were included in that part of the study. Maria's students were given the questionnaire to do for homework and as a result only 9 completed it, whereas Albert's group completed it in class so all 19 students who attended that day handed one in.

Table 3.6: Participation in the main study

	Number of students	Participation in lesson transcripts	Participation in interviews	Participation in questionnaires
Albert's group in El Raval	26	26	20	19
Maria's group in La Garriga	25	25	23	9
Belén's group in La Garriga	20	20	0	0

When I went back to the La Garriga school for a follow up questionnaire in 2012, ten students, who were now in 1st of *bachillerato* participated. Of these, five had studied with Maria and Belén in the 2008-09 main study, and five had not (see table 3.7).

Table 3.7: Participation in the follow-up study

	Number of students	Participation in questionnaires	Number that had participated in 2008-9 main study
Maria's 1st *bachillerato* group	10	10	5

3.5.2.3 Schools

The main study took place in two very different schools in Catalonia, that were both teaching science in English to children in the second year of ESO (13-14 year old students). One school is based in La Garriga, an affluent spa town in the *Valles Orientales* (eastern valleys) about 40 km from Barcelona and the other is situated in El Raval, a densely populated inner city area of Barcelona where 47.4% of the population were born abroad (*Fundación Raval Solidari*, 2015). Although this was not part of the original scope of the project, the fact that half of the students in the El Raval school were non-native speakers of Spanish or Catalan provided an opportunity to look at how students with a different linguistic and cultural background responded to CLIL.

Despite the obvious differences in setting outlined above, the schools themselves are very similar in terms of size and organisation. Both are entirely state-funded, with approximately 400 secondary school students between the ages of 11 and 18. All teachers have passed *oposiciones,* and classes should have no more than 25 students. The La Garriga school has a woodland area outside the classrooms, which enables students to use the space for science projects, a resource that students at the El Raval school do not have available to them. In terms of access to materials for experiments (test tubes, Bunsen burners, etc.) and computers, however, there is little difference between them.

Insofar as it was centred on just three schools, this research constitutes a small case study. However, since my intention is to obtain a rich and deep dataset, I would say this does satisfy sound research criteria.

3.5.2.4 Students

In both schools in the main study, there were approximately 25 students in each 2nd of ESO science group who studied together. In the La Garriga school the students were not streamed, and contained a variety of levels of ability and English, including three students with special educational needs. In the El Raval school, students studying science were divided into four groups. According to their teacher, Albert, students were streamed according to how hardworking and responsible they were, rather than on the basis of ability. Those in Albert's group were considered to be those most interested in studying in the year. Students in the second year of ESO are between 13 and 14 years old. However, in the Spanish school system students can be kept back a year, so it is possible that some students were slightly older.

The students in La Garriga were almost entirely Catalan- and Spanish-speaking. Of the nine students who handed in questionnaires, six stated they spoke only Catalan at home, one spoke Spanish, one Catalan and Spanish and one Catalan and German. The El Raval students had a much more varied linguistic background. Of the 19 who handed in questionnaires, ten spoke only Spanish at home, four spoke a Philippine language (three Tagalog and one Ilocano), and of the four who cited another language (Chinese, Bulgarian, Bengali and Arabic), three of these said they also spoke Spanish at home. Only one student spoke Catalan as well as Spanish at home. Most of the Spanish-speaking students originated from South American countries such as Colombia and Peru.

Despite the differences in cultural background of the students and relative wealth of the areas where the schools are situated, there did not seem to be any obvious differences in the behaviour and attitudes of the students between the two schools. Both groups of students had days when they were attentive and well-behaved and other days when they were more disruptive. However, the teachers were more than capable of handling any disciplinary problems that arose, and seemed to be respected by the students who were, for the most part, attentive and cooperative.

The level of English of the students among students varied considerably. Among the La Garriga group, most students had an elementary or pre-intermediate level (between A1 and A2 CEF), with the exception of a handful of students who attended private English academies in the evening and whose levels were intermediate (B1). All of these students had lived in Catalonia their whole lives which means since the age of six they had done three hours of English a week, so in theory had studied 540 hours of English each.

Among the sample in Raval, some students had received all or part of their primary education outside of Spain, and therefore had studied less than 540 hours English. Thus, at one end of the spectrum, there were students who were almost new to English with a beginner or A1 level. At the other end, there were students from the Philippines who said they felt more comfortable speaking English than Catalan or Spanish, and who had at least an upper intermediate (B2.1 or B2.2) level. These divergent levels had implications for the study. In particular the issue of whether using English in the classroom would be a leveller for pupils who did not speak Catalan or Spanish as their mother tongue.

3.5.2.5 Teachers

In the main study, both projects were led by a dedicated science teacher who had volunteered to teach their subject in English and were each supported by a teaching assistant provided by the British Council. Maria and Belén worked in La Garriga and were supported by Joanna, a teaching assistant from the UK. In El Raval, Albert worked with the support of Tom, who was also from the UK. When I was in the classroom, recording and observing lessons, I also acted as an additional teaching assistant.

Maria has 20 years experience teaching science to secondary school students and had attended the CLIL training programme at The University of Nottingham for content teachers in Catalonia. Since then, she had been practising CLIL, and the academic year 2008-2009 was her second year of using CLIL in her science classrooms. Belén also had 20 years experience teaching science to secondary school students but had not had any CLIL training. This was her first year teaching in English. Albert in El Raval was a younger teacher with only a few years teaching experience. He had attended a one-day course on CLIL methodology in Barcelona and this was his first year teaching science in English. All three teachers had a very engaging style of teaching and were excellent at classroom management. Both Albert and Maria had an advanced or C1.1 CEF level of English, while Belén had an intermediate (B1 CEF) level.

Teaching assistants from the UK, recruited by the British Council to support CLIL teachers, worked alongside both teachers. Joanna, who worked in La Garriga with Maria, had just graduated from university in the UK with a degree in Spanish. She did a TEFL (Teaching English as a Foreign Language) course before working at the school and also taught

English at a local academy. As a result, she quickly developed confidence as a teacher, and within a few months Maria trusted her to manage her own small groups of students. Tom, the teaching assistant who worked with Albert, was also a recent graduate, but did not have any previous teaching experience, and he worked purely as a language assistant in class to support Albert, monitoring activities and providing assistance with any unknown vocabulary.

In addition, a special-needs teaching assistant called Josep, who only spoke Spanish and Catalan, attended Maria's classes at the La Garriga school. The role of this teacher was to support three boys in the group who had a range of learning difficulties. In the follow-up study, the focus was one group of *bachillerato* students studying science with Maria from the main study. The class size was much smaller, with only 12 students and there were no teaching assistants.

3.5.3 Research methods

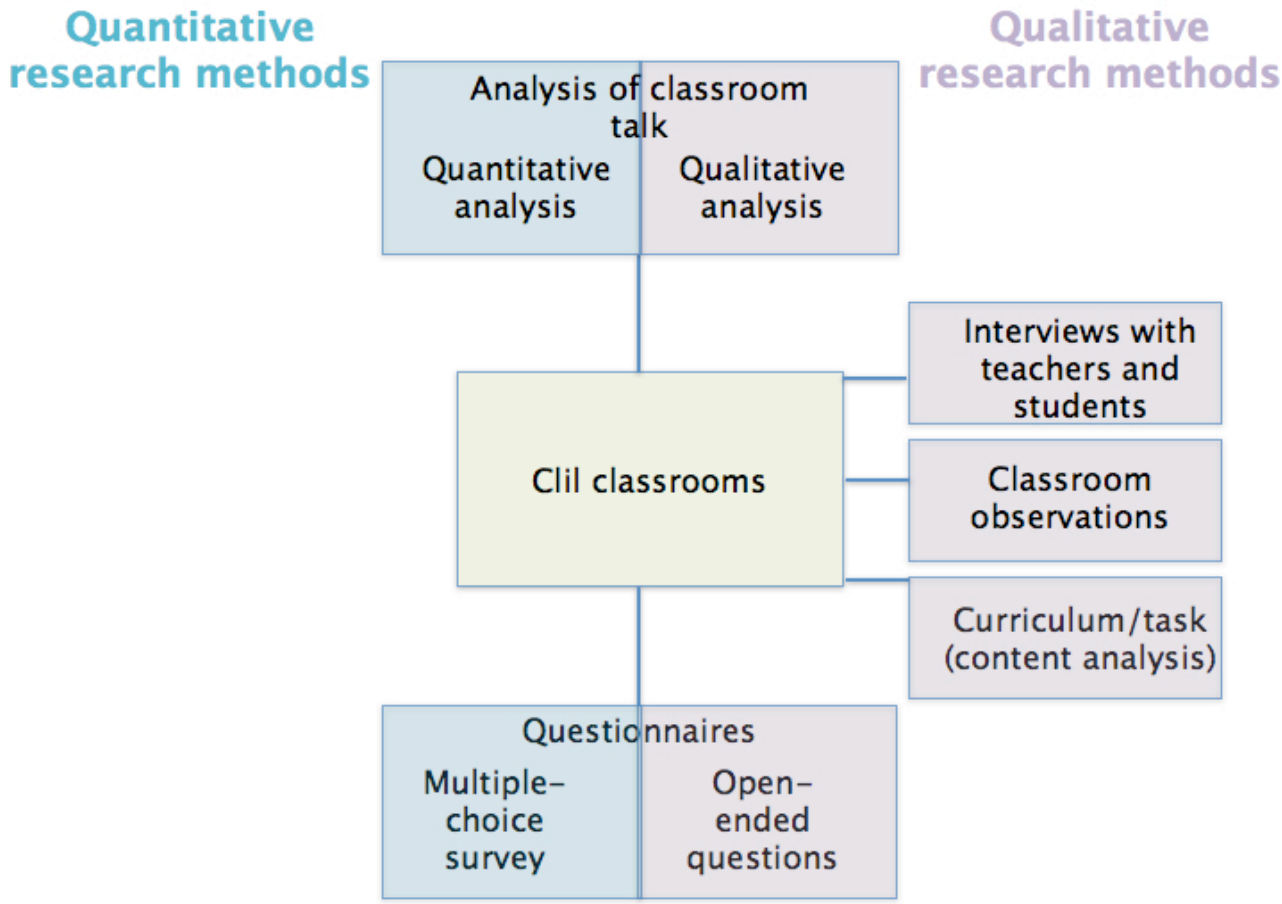
3.5.3.1 Combined use of quantitative and qualitative research methods

At the beginning of this chapter, I describe why I opted for an interpretivist rather than a positivist paradigm, using mainly qualitative rather than quantitative methods. Rather than setting out to use a mixed-methods approach, each research tool was chosen on the basis of how effectively it would answer the research questions. By studying the data from more than one standpoint and using both quantitative and qualitative methods, I sought to fully investigate the complexity of the subject matter. The quantitative data, gathered by coding lesson transcripts, helped me to observe the differences between English and Catalan language science classes, while student responses in the questionnaires gave me the opportunity to compare the learning experience among the majority of participants. The qualitative data I collected in the interviews and open questions helped me flesh out some of these answers with the subjects' own observations and insights. Moreover, it was the qualitative analysis of the lesson transcripts that provided solid examples of learning taking place.

Another advantage of using a variety of methods is that it enables triangulation to be used. Easterby-Smith et al (1991) describe data triangulation as the gathering of data both from a variety of sources and over a period of time. They argue that the advantage of triangulation and using mixed methods is the ability to offset the problems that each data collection method has. In addition to this, triangulation reduces the reliance on a single method that could 'bias or distort the picture' (Cohen et al, 2007: 141) and provides a way of demonstrating validity, by having the data gathered from one source correlate with data gathered from another source (Lin,1976, as cited in Gray, 2004).

The different research methods I used in the main study are presented in Figure 3.1 below.

Figure 3.1: Quantitative and qualitative methods used.



3.5.3.2 Analysis of classroom talk

Analysing the discourse that takes place in a classroom is an effective way to eavesdrop on learning in context, and provide evidence for learning processes. Edwards and Westgate describe how the close inspection of talk in the classroom can make the curriculum more visible and demonstrate students' thought processes in action. It also provides insight on the behaviour of teachers and the way they use their knowledge. Moreover, classroom discourse also reveals how pupils display their skills and their awareness of their skills. (1994).

Using transcribed discourse as a source of data allows the researcher more time to analyse proceedings than an observation instrument would. Once transcribed, the data are in permanent form so verification through reanalysis and replication is possible (Cohen et al, 2007). As well as examining the meaning of utterances in their context, quantifiable data can be generated from the transcripts by coding it according to pre-existing themes or new ones that emerge (*Ibid*).

There are, however, disadvantages to coding discourse in this way. Inconsistent classification of text can result from human error, and some of the detail in 'the nuanced richness of specific words and their connotations' (*Ibid*: 490) can be lost by reducing the text to categories and codes. Researchers may assign categories, which reveal their agenda and impose a meaning on the text that the speakers did not intend (Weber, 2009, as cited in Cohen et al, 2007) or be selective in the sources of transcripts they include in a project. Edwards and Westgate also caution that analysing classroom talk on its own is not enough, since ‘so much more is understood than is ever said’ (1994: 14) and recommend that researchers ‘adopt appropriately complex and sensitive forms of enquiry and explanation’ (*ibid*: 14).

Despite these drawbacks, lesson transcripts provide the classroom-based researcher with a detailed record of what happened in a particular class and show evidence of learning outcomes. The procedure for analysing the transcripts is described in section 3.5.4 of this chapter.

3.5.3.3 Classroom observation

Observing classrooms provides the researcher with ‘live’ data from a situation that occurs naturally (Cohen, et al, 2007). While the audio transcripts I collected provided me with a recording of what was said in the classroom, my observations were able to provide additional information that did not appear in the transcripts. This included the physical setting (whether the lesson took place in a laboratory or a classroom), the number of students in attendance and how they were arranged: whether they were sat in rows or grouped together around desks. I could observe the body language of the teachers and students and pick up on teaching techniques that relied on visual aids, such as the board, pointing to materials in the room or mime to explain a concept. My observations enabled me to add notes to my transcripts and fill in the gaps, for example, when I noted in one of Maria's lessons that she linked arms with a student to demonstrate covalent bonds.

One of the reasons I chose to use observations was to compensate for the fact that the analysis of discourse using the SETT Framework (Walsh, 2006) and my own IRFEx coding system favoured teacher-led interaction, since it was sequences of teacher-led dialogue that feature most in the transcripts. The parts of the lesson when students were engaged in practical activities or completing tasks on a handout mostly did not appear in the IRFEx and SETT data. However, the observations I made in notebooks include details on what was taking place at each point in the lesson, whether students seemed engaged or not, and how the teacher was managing the group and responding to the needs of students, for example, with additional explanations in English or Catalan.

3.5.3.4 Curriculum/task (content) analysis

As Cohen et al (2007) point out, not all knowledge can be included in a country's curriculum, and the knowledge that is selected tells us much about the politicians that are currently in power. In Spain, a new national curriculum is released on a regular basis, usually with each change in government. The latest curriculum (*Ministerio de Educación, Cultura y Deporte,* 2014), set out learning outcomes in minute detail, for example, listing words and expressions that 6-year olds should know in English and the content areas they should be studying in subjects like science and geography at each age. The curriculum is designed to address Spain's poor performance in PISA reports and surveys of English proficiency levels (e.g. European Commission, 2012). But, while the demands on students and teachers increase, the methods prescribed do not change and rely on a didactic approach and frequent testing. This, according to Marqués (2014), leads to Spain's low performance in such reports and a high dropout rate among secondary school students.

In this study, the role of the curriculum and how it was adapted to the CLIL lessons was a source of discussion and conflict throughout the project, as I will describe in later chapters. My interest in the curriculum, and the lessons and tasks within it, was focused on how teachers were able to adapt the curriculum to the English levels of their students.

Moreover, I was interested in whether they could incorporate aspects of good practice CLIL into their lessons, for example by adopting the 4Cs (Coyle, 1999), Task Based Learning (Willis, 1996) and a more student-centred and communicative approach.

3.5.3.5 Interviews with students and teachers

I chose a semi-structured approach to interviews for the main study to ensure that the relevant themes were covered, but to allow the flexibility to explore particular points that came up in greater depth.

Interviews provide participants with the chance to talk about their interpretations of the world in which they live, and to express how they regard situations from their own perspective (Cohen et al, 2007). In this sense interviews provide a subject-centred approach to research. They are a flexible tool for data collection, in that the order of questions can be changed and the interviewer can ask participants to expand on their answers and press them on 'complex and deep issues' (Cohen et al, 2007: 349). In this way, interviews provide what Lincoln and Guba would call a 'thick description' (1985: 319-320), something that a self-report questionnaire may not be able to achieve. However, interviews are time-consuming to conduct, and can be prone to interviewer subjectivity and bias (Cohen et al, 2007).

A number of interview styles are available to the researcher. In the 'Interview guide approach' (Patton, 1980), the interview specifies the topics and issues to be covered in advance, but the interviewer decides the sequence during the interview. An advantage of using this method is that having an outline means the data collected is comprehensive, and that interviews have an informal, conversational style that can help put participants at ease. However, important topics can be left out and slight changes in the way an interview words a question can guide participants towards different responses (*ibid*). I have described the interview procedures I used in section 3.5.4 of this chapter.

3.5.3.6 Questionnaires

Cross-sectional surveys (administered at a particular point in time) are a quick and cheap way of gathering data from a large group of respondents. They enable researchers to process data statistically, use it to make generalisations about their subjects and compare different groups of respondents (Gray, 2004). In addition, anonymous self-report questionnaires give participants the opportunity to report honestly on an experience without the external influence of an interviewer or peers in a focus group swaying their views and opinions.

However, there are several disadvantages to using surveys, due to their reliance on large-scale data. Its degree of explanatory potential or fine detail is limited (Cohen et al, 2007) because 'it is lost to broad-brush generalisations, which are free of temporal, spatial or local contexts' (*ibid*: 207). Moreover, participants are confined to answer questions set by the researcher and the issues that they think are important (*ibid*).

In order to overcome the general nature of surveys, open-ended questions can be asked, which provide extra depth to students' responses and give them a chance to speak with their own voice, rather than choosing which of the researcher's pre-determined answers they agree with. The open-ended responses are the ones that may feature the 'gems of information' (Cohen et al, 2007: 330) that may not be identified in the questionnaire. Moreover, these open-ended questions can capture the 'authenticity, richness, depth of response, honesty and candour' (*Ibid:* 330) which are the principal characteristics of qualitative data.

Comparisons are harder to make with open-ended answers, although the potential to see more nuanced views and processes offsets this difficulty, as long as the analysis process is robust and consistent. Also, as the act of writing sentences is more time consuming and demanding than ticking a box, some participants may be more able to make thoughtful comments than others. For this reason, I gave students the opportunity to answer in Spanish, Catalan or English. The questionnaire procedures are explained in section 3.5.6 of this chapter.

3.5.4 Procedure and analysis

3.5.4.1 Procedures for recording and transcribing classroom discourse

In the main study, I recorded 20 hours of science lessons in the schools in La Garriga and El Raval, using a handheld digital voice recorder placed on a desk in the middle of the room during open class discussion. I moved the voice recorder around the room during experiments to record student discourse.

Of these 20 hours of lessons, 16 were transcribed and analysed (see table 3.8). The four lessons that were not included for analysis were all taught by Maria (three in Catalan and one in English). These omitted lessons were repeats of other lessons that were transcribed and included in the data set, but were of a poorer sound quality, which would have made it difficult to transcribe teacher and student discourse

Table 3.8: Transcribed and coded lessons in the main study

Lesson number (teacher)	**Language**	**Subject**	**Number of students**	**Date**
Lesson 1 (Maria)	English	Water particles	12	Nov 25, 2008
Lesson 2 (Maria)	English	Density of liquids and solids	12	December 2 2008
Lesson 3 (Maria)	Catalan	Distillation	12	February 25 2009
Lesson 4 (Albert)	English	Liquid dilatation	22	May 15, 2009
Lesson 5 (Joanna)	English	Solids, liquids and gases	11	Jan 28, 2009
Lesson 6 (Maria)	English	Solids, liquids and gases	11	Jan 28, 2009
Lesson 7 (Joanna)	English	Solids, liquids and gases	11	February 10 2009
Lesson 9 (Maria)	Catalan	Evaporation	13	February 3 2009
Lesson 10 (Maria)	Catalan	Distillation	13	February 3 2009
Lesson 12 (Maria)	Catalan	Light dispersing through water	12	February 17 2009
Lesson 13 (Maria)	Catalan	Mixing solids and liquids	14	Mar 3, 2009

Lesson number (teacher)	Language	Subject	Number of students	Date
Lesson 15 (Belén)	English	Mixing solids and liquids	12	Mar 4, 2009
Lesson 16 (Belén)	English	Mixing solids and liquids	8	Mar 4, 2009
Lesson 18 (Belén)	English	Heat	11	Mar 25, 2009
Lesson 19 (Belén)	English	Heat	7	Mar 25, 2009
Lesson 20 (Albert)	English	Heat - dilatation	22	May 7, 2009

The English lessons were transcribed by myself and the Catalan lessons were transcribed by a native Catalan speaker, and then I translated them into English. I attempted to transcribe all of the discourse in the recordings, but there were times when there were several voices speaking over each other and I was unable to make out what was being said. For example, when students were completing worksheets either in pairs or groups, it was rare that coherent discourse was discernible. Instead, I could hear the hum of student voices sharing answers. This was also the case during some practical activities when students were actively discussing and in some case disputing their tasks and talking over each other in a mixture of the languages. In both these cases, I have added notes to the transcription document to indicate what was happening in class. Where it was possible to make out distinct voices during a practical activity, I transcribed the discourse and included it in the data. As a result of these factors, and because the balance in the lessons was often heavily weighted towards teacher talk, the majority of the discourse in the transcripts involves the teacher leading the class in discussion.

Of the 16 lessons included in the study, 11 were conducted mostly in English and five in Catalan. The amount of transcribed and coded data, however, is more or less the same. Of the contributions that were coded, 598 or 54% took place in the CLIL lessons and 518 or 46% were in the L1 classes. More time was spent in the L1 lessons in teacher-led presentation and discussion, which resulted in the production of more transcribable dialogue.

3.5.4.2 Analysis of transcripts - a multi-layered approach

I analysed the transcripts in three main ways: through the SETT (Self Evaluation of Teacher-Talk) Framework (Walsh, 2006), through my own coding system and through an analysis of classroom communication patterns. I hoped that these three layers of analysis would give me both a broad perspective on the structure of lessons (SETT) and also a close up look at the micro detail of what was actually said.

3.5.4.3 SETT Framework

Walsh (*ibid*) warned that system-based interaction analysis such as the COLT system (Communicative Orientation in Language Teaching) (Allen, Frohlich and Spada, 1984), which comprises 73 categories of interaction, can fail to take adequate account of the context of lessons. These systems look at discourse from an etic (from the outside) rather than an emic (from the inside) perspective. Ad hoc approaches, on the other hand, offer the construction of a more flexible instrument based on a specific problem or area of interest and are more likely to promote understanding and generate explanations.

Discourse Analysis inevitably involves simplification and reduction and, according to Walsh (2006), fails to take account of more subtle forces at work such as role relations, context and sociolinguistic norms. The aim of his SETT framework is therefore to foster an understanding of interactional processes that take place in the classroom. The modes that Walsh identifies are as follows:

- Managerial, used to transmit information, organise the physical learning environment and to introduce or conclude activities.
- Materials, used to provide input or practice around a piece of material. Walsh's interactional features for materials mode include a predominance of IRF sequences, display questions and corrective repair.
- Skills and systems, used when the teacher elicits answers from students with display questions and form-focused feedback.
- Classroom communication, used to help learners express themselves clearly, and characterised by extended learner turns, minimal repair and referential questions.

By dividing a lesson into these four modes, the inter-relation of pedagogy and interaction can be seen through talk. 'Pedagogic goals are manifested in the talk-in-interaction' (*ibid*: 62)

By using a multi-layered approach, and analysing the data using the SETT Framework, I hope that a broad interpretation of the transcripts will be possible, and insight on the interactional aspects of the lessons, as well as the talk, will be gained.

From the original 20 hours of transcribed lessons, I chose eight (six conducted in English and two in Catalan) for analysis using the SETT framework. These lessons were chosen for their similarity in format, in that they all included at least one practical activity and some teacher-led discussion. The classes differed in the number of lines of transcribed dialogue, with the CLIL lessons containing considerably fewer. This is partly because students spent more of the lesson working in small groups completing worksheets and conducting experiments. Moreover, each line represents a speaker turn, and in the L1 lessons, turn-taking was more dynamic, with students asking and answering more questions. In the CLIL environment, there are times when a turn continues in the hands of the teacher for several minutes without any student involvement. The word count (included in table 3.9 below) is a more reliable indicator of the volume of discourse than the number of lines, while the number of lines shows how frequently the turns change hands.

Table 3.9: Lessons included for SETT analysis in the main study

Name of lesson	**Date**	**Number of students**	**Topic**	**Language of instruction**	**Lines of discourse (turns) categorised into SETT modes**	**Word count in lesson**
Lessons taught by Maria						
Lesson 1	November 25 2009	12	Water particles	English	24	1057

Lesson 2	December 2 2009	12	Density of liquids and solids	English	74	1325
Lesson 12	February 17 2009	12	Light dispersal in water	Catalan	105	2585
Lesson 13	March 3 2009	14	Mixing solids and liquids	Catalan	148	2477
Lessons taught by other teachers (all in English)						
Lesson 16 (Belén)	4/3/09	8	Heat		155	1288
Lesson 19 (Belén)	25/03/09	11	Heat		88	1225
Lesson 4 (Albert)	15/5/09	22	Heat		71	1405
Lesson 20 (Albert)	7/3/09	22	Heat		217	4054

To make it easier to identify the mode used in the extracts of transcripts, I have used colour to indicate each SETT mode: red for managerial, blue for skills and systems, green for materials and orange for classroom communication.

3.5.4.4 Development of own coding system (IRFEx)

Following on from the SETT analysis, I then created my own coding system based on the types of utterances that seemed to occur most frequently in the transcripts.

The starting point for this coding system was Lemke's (1990) IRF (Initiation Response Feedback) framework. In an IRF sequence, the teacher initiates an exchange (the I-event), usually with a question, which students respond to (the R-event). The teacher then responds and provides feedback (the F-event). IRF was chosen as opposed to IRE (Initiation Response Evaluation) (Sinclair and Coulthard, 1975) as in this pattern teachers typically ask closed display questions, which result in a short factual answer from students and an evaluation from the teacher that ends the communication (Nathan, Kim and Grant, 2009). With IRF, the teacher uses the F-event to elicit further contributions and the dialogue continues (Wells, 1993). This type of teacher response seemed more in evidence in the data transcripts and was chosen for this reason.

In addition to the already established IRF-events, I chose to add an extension move (Ex-event) to the coding system to show where teachers or students continue a discussion thread with follow-up or extension questions, rather than begin a new topic with a new I-move.

Within the IRFEx structure, contributions were further coded with the aim of showing:

- the types of questions asked by teachers and the expectations this shows they had of their students.
- the responses elicited from students and the levels of thought these responses demonstrate.
- how teachers provided students with feedback and how they attempted to develop the point further with extension questions.

These codes were based on a number of previously designed coding systems for classroom dialogue including Flanders' Verbal Interaction Category System (adapted from Amidon and Hunter, 1967), which divides classroom interaction into ten categories, under the headings of teacher-initiated talk, teacher-response talk, pupil-response talk and pupil-initiated talk, and the 17 categories for coding verbal transactions outlined by Kerry (1982, as cited in Edwards and Westgate, 1994). These categories are divided into teacher talk, teacher questions and pupil responses. Eight types of teacher questions were identified including management level (e.g. are you paying listening?), analysis level (e.g. why do you think A causes B?) and evaluation level (what did we learn today?). Similarly, pupil responses were divided into management, data, concept and abstract level. The intention of this coding system was to grade the quality of thought that lay behind each statement, question or response, although Edwards and Westgate (1994) argue that pupils' answers rather than being a direct reflection of their level of understanding may have been produced by their accurately 'reading the clues' (*ibid*: 89) given by the teacher.

The codes used in this study are designed in the same way as Kerry's, to try to assess the level of thinking behind contributions. In particular, I wanted to show that the questions teachers chose to ask reflected their expectations of students' linguistic and scientific knowledge.

All the codes used in this study are listed in table 3.10. They have been divided into the four stages of initiation, response, feedback and extension.

Initiation (the I-move)

The verbal transactions included at the initiation stage are questions asked by both the teacher and students to start a new discussion thread or topic. Initially I thought that student questions would fit better in the R-move category. However, there are many examples of students asking a question to begin a new IRFEx sequence, particularly in the L1 lessons, so it seemed more logical to include these student questions as I-moves, although they have been coded separately to clearly indicate whether they were made by a student or a teacher. In Nathan, Kim and Grant (2009), student-led Initiation-Demonstration-Evaluation (IDE) patterns are also used as a unit of analysis to indicate where students initiate discussion.

Open and closed questions are categorised separately in the database. Open questions give the respondent freedom to provide a range of answers and can put higher demands on the questioner, since the answers received may be unpredictable. In contrast, closed questions leave control of the conversation with the questioner (Dalton-Puffer, 2007), and, at the same time, are quick and simple for the respondent to answer. Closed 'known-answer' questions are more typical of IRE exchanges which offer students reduced potential to verbalise their own ideas (Cullen, 2002) and lead to a monologic exchange (Bakhtin 1986), unlike the dialogic discourse outlined in Mortimer and Scott's (2000) framework, which supports challenge and debate and often includes open questions.

In the context of the science classroom, open questions put greater demands on students' scientific knowledge, and in a CLIL environment, more is required of their linguistic skills. For example, in a lesson on Heat, Albert asks, 'can you tell me different kinds of energy?' (Lesson 20), a question that requires students to have the knowledge and range of vocabulary to provide answers such as nuclear, electric, chemical, solar, etc. However, a closed question such as 'is there a thermocline in the summer?' (Lesson 6), while a good way for a teacher to check students understanding, only requires students to understand the question and respond ‘yes’ or ‘no’.

In Dalton-Puffer’s 2007 study on CLIL classrooms in Austria, she develops a typology of questions based on the types of information asked for. She categorises them as:

-questions for facts
-questions for explanations
-questions for reasons
-questions for opinion
-meta-cognitive questions

In her results, the questions for facts dominated the study with 89% compared with 11% for the other four types.

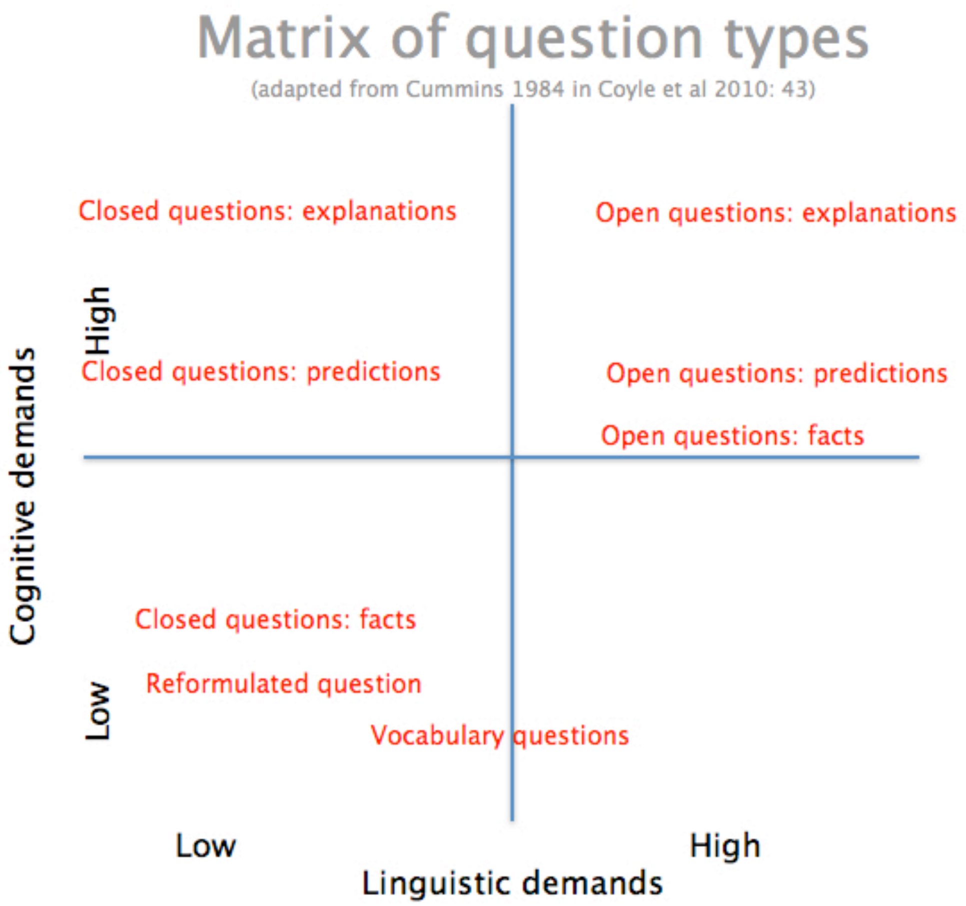
The typology of questions in this study has been created in the same way and is also based on the information asked for. They are categorised as:

-questions for facts
-questions to elicit a description
-questions for explanations
-questions to elicit a prediction
-vocabulary questions
-reformulated questions (when the teacher gives students a clue or reframes the question in simpler language)
-other elicit

The questions that require facts and descriptions test students existing knowledge, while the questions for explanations foster what Van Zee and Minstrell (1997) call ‘reflective discourse’. In this scenario, teachers follow up a student contribution with questions that try to reflect back to students what they are thinking and give them sufficient space to communicate their own ideas.

The most demanding questions in terms of learner cognition are those related to explanations and predictions, and the lowest are those that elicit vocabulary explanations and science fact. Higher linguistic skills are needed to answer the open questions than the closed ones. In figure 3.2, I have mapped the relative cognitive and linguistic challenge of the questions posed by teachers in the study onto Cummins' Matrix (1984).

Figure 3.2. Matrix of question types



Response (the R-move)

The majority of R-move contributions in the data were made by students. However, when an IRFEx sequence is initiated by a student and the teacher responds to a question or comment, this teacher contribution has been included in the R-move.

The vast majority of student responses have been coded as short responses (three words or less) and long responses (four words or more). I chose this distinction as a way to compare the linguistic content of student contributions between the L1 and CLIL lessons as it was noted by teachers that students were quieter and less participative in the CLIL environment. Short responses were used to answer all question types and are not necessarily an indication of the quality of thought involved in providing the answer, however the longer answers tend to involve whole sentences, and therefore show a higher level of linguistic competence among students.

I chose seven categories of student responses based on what I observed to be the most common utterances in the transcripts. These seven categories are:

- short response of three words or less
- long response of four words or more
- science question
- vocabulary question
- unsolicited observation
- student saying they do not understand
- student responding in a mix of languages

Feedback (The F-move)

Feedback was categorised into:

- accepts answer
- rejects answer
- additional explanation
- translates answer into English
- answers a student's question/responds to a student's comment
- checking understanding

Positive and negative evaluations were separated to determine if teachers were less inclined to provide negative feedback in the CLIL setting.

An 'additional explanation' involves a teacher adding more information to a student response or rephrasing it in an attempt to emphasise and clarify the point. In addition to this, 'translates L1 answer into English', 'answers a student's question/responds to a student's comment' and 'checking understanding' have been included in the F-stage

Follow-up questions (the Ex-move)

Extension (Ex)-moves are follow-up questions asked by both teachers and students to continue a discussion rather than start a new topic. The typology for them is the same as for I-moves (see above), but the utterances have been coded to distinguish them from each other.

Questions have been divided into Initiation and Extension moves in order to distinguish between questions that begin a new sequence of dialogue, and those that extend a topic. While Wells (1999) codes all questions as I-moves, regardless of whether they are follow-up questions or related to a new topic, Dalton-Puffer (2007) uses codes such as F/I, F-I and F+I to show a combination of feedback and initiation and only codes the first teacher question in an exchange as an I-move. In Edwards and Westgate (1994), the I-move is used whenever the teacher changes the subject and E-I (Evaluation-Initiation) to indicate a follow up question.

In order to show where questions are examined in greater depth, I decided to use the I-move on its own only for the first teacher question in a sequence or when the subject is changed completely, for example, 'so, now we're going to do an experiment...' and use an Ex-move to show questions that are part of an already-established sequence of IRF.

In addition to the main division of discourse into I, R, F and Ex moves, I subdivided contributions based on their typology (see table 3.10).

Table 3.10: Categories for coding verbal contributions in the main study

Description	Codes	Example
Teacher Initiation (I move)		
Vocab question	I1C (Catalan)	
	I1E (English)	What is ‘tap water?’
Elicits science fact (open question)	I2C	
	I2E	What floats on water?
Elicits science fact (closed question)	I3C	
	I3E	Do the particles move quicker?
Elicits science explanation (open question)	I4C	
	I4E	Why did the colouring spread so quickly?
Elicits science explanation (closed question)	I5C	
	I5E	Was it because the particles were moving quicker or more slowly?
Asks students to describe something (open question)	I6C	
	I6E	What can you see in the beaker?
Asks students to describe something (closed question)	I7C	
	I7E	Did the egg float or sink?
Reformulates question or gives a clue	I8C	
	I8E	faster or slower?
Other type of elicit (open question)	I9C	
	I9E	What do we have in the laboratory to make water evaporate?

Description	Codes	Example
Other type of elicit (closed question)	I0C	
	I0E	Do you have a marble counter top in your kitchen
Student Initiation (I move)		
Asks a science question	IS4C	
	IS4E	Does it have a classification?
Asks a vocab question		
	IS5C	What means lukewarm?
	IS5E	
Iniitiates IRF sequence with an observation		
	IS6C	When you make mashed potato and you add the milk the milk stays at the top
	IS6E	
Student response (R move)		
Short response	R1C	
	R1E	Bigger
Long response (4 words or more)	R2C	
	R2E	It’s easier to separate
Science question	R4C	
	R4E	
Vocab question	R5C	What does ‘cork’ mean?
	R5E	
Unsolicited observation	R6C	But you don’t mix it
	R6E	

Description	Codes	Example
Student says they don’t understand	R7C	
	R7E	
Student response in mix of languages	R8M	It’s molt small
Teacher response (R move)		
Teacher responds to student question or comment		
	RT5C	
	RT5E	No, it can’t be called an emulsion
Teacher feedback (F move)		
Accepts answer	F1C	
	F1E	Yes, exactly
Rejects answer	F2C	
	F2E	Not sinking, the opposite of sinking
Additional explanation	F3C	
	F3E	The water goes inside and takes out the air
Translates L1 answer into English	F4E	
Answers a student’s question/responds to a student's comment	F5C	This is water on its own, it doesn’t dissolve
	F5E	
Checking understanding	F6C	
	F6E	Does everyone see that the answer is ‘mixed’?
Teacher extension (Ex move)		
Vocab question	Ex1C	

Description	Codes	Example
	Ex1E	
Elicits science fact (open question)	Ex2C	
	Ex2E	
Elicits science fact (closed question)	Ex3C	
	Ex3E	
Elicits science explanation (open question)	Ex4C	
	Ex4E	
Elicits science explanation (closed question)	Ex5C	
	Ex5E	
Asks students to describe something (open question)	Ex6C	
	Ex6E	
Asks students to describe something (closed question)	Ex7C	
	Ex7E	
Reformulates question or gives a clue	Ex8C	
	Ex8E	
Other type of elicit (open question)	Ex9C	
	Ex9E	
Other type of elicit (closed question)	Ex0C	
	Ex0E	
Student extension (Ex move)		
Asks a further science question	ExS4C	
	ExS4E	

The conventions for coding teacher and student participation are based on those used in Discourse in Content and Language Integrated Learning (CLIL) Classrooms (Dalton-Puffer, 2007) and are as follows:

T	Teacher
T1, T2	Teachers in team-teaching situations
I	Interviewer
S	Unidentified student
S1/S2	Student 1 and Student 2 in cases where more than one student participating
SS	Several or all students simultaneously
.. ...	short pause, long pause: within or between utterances
?	rising intonation (when used by teachers, tends to indicate eliciting from students)

Commentary in the transcript

((laughs))	comment about actions, including non-verbal actions
(xxx)	indicates a stretch of talk unintelligible to the analyst
(founder)	indicates an unclear or probable item
//thanks//	indicates the English translation of an utterance made in Catalan or Spanish
molt bé //very good//	As above, including the original utterance in L1

Utterances in Catalan and Spanish, for the purposes of this study, have been counted together as L1. Albert tended to use Spanish rather than Catalan, which reflects the high number of Spanish as opposed to Catalan-speaking pupils in his classroom, while Maria and Belén used more Catalan than Spanish as La Garriga is a predominantly Catalan-speaking town.

By using both the established SETT framework and my own IRFEx coding system, I aimed to reveal how interaction took place in the classrooms in my study in different ways. The SETT analysis provides a snapshot of interaction types in a classroom. We can easily see an overview of how much time was spent in each lesson in each mode and compare CLIL and L1 lessons and lessons between teachers (e.g. Figure 6.1 in chapter 6). The IRFEx coding system provides a much more detailed account of utterance types, and since the list of utterances were drawn from the transcripts in this study, all of the categories are appropriate to the data. SETT was originally designed for English language classrooms, and while it suited the format, it was not always a perfect fit, for example, in the very low rate of classroom communication that occurred across all of the lessons in this study.

The two systems complemented each other in the way that they enabled the classroom transcripts to be analysed in two ways: SETT at a very broad and IRFEx at a very detailed level. They also provided similar results as we will see in later chapters. For example, the low rate of classroom communication in the CLIL lessons correlates with the low frequency of student questions in those settings.

A limitation of SETT and IRFEx is their reliance on teacher-led classroom discourse. However, by using additional research tools, such as classroom observation and curriculum/task (content) analysis, I am able to present an account of what happens in the lessons when the teacher is not leading the class and other events are taking place.

3.5.4.4.1 Methodological contribution

In order to analyse the transcripts that I recorded in the CLIL and L1 lessons, I created a coding system which develops those of Sinclair and Coulthard (1975) and Lemke (1990). The development of this coding system has made a significant contribution to the field of classroom discourse analysis. My addition of the Ex move is an effective way of highlighting the distinction between teachers developing a point further or choosing to move to a new one. This distinction was not possible with previous coding systems, which did not distinguish between initiation and extension questions. This addition of the extension question as a separate category is particularly valuable because it shows the depth of content explored in a lesson. Extension questions tend to be more complex than initiation questions and show that the teacher believes their students capable of exploring an issue in greater depth.

3.5.4.5 Reliability of coding

I did the majority of coding, and my colleague, Jim Chillman, also coded 1 lesson to check reliability. Reliability was 86% for identifying the categories. The main area of confusion was between students asking a question and saying they did not understand something.

This could have been overcome by giving Jim a comprehensive list of the different ways pupils could express that they had not understood.

3.5.5 Interview procedure

3.5.5.1 Interviews with teachers

The three teachers who taught CLIL science to 2nd of ESO students in the main study in the academic year 2008-2009 were interviewed about their experiences. The interviews were conducted at the end of the academic year (June 2009) and lasted for approximately an hour. Maria and Belén were interviewed together, and Albert was interviewed separately. Both interviews were semi-structured in format, using a number of pre-determined questions (see Appendix 9), and became progressively more conversational and informal towards the end of the hour. These interviews were conducted entirely in English and recorded with the permission of the participants. In the follow-up study, in 2012, I interviewed Maria without pre-planned questions in an unstructured interview.

3.5.5.2 Interviews with students

Semi-structured interviews were used to collect additional qualitative data from students on the learning experience. I interviewed randomly selected students in focus groups of between four and seven students per group during class time in June 2009. In total, 22 students from La Garriga and 21 from El Raval were interviewed. The interviews lasted approximately ten minutes for each group and were conducted in a mixture of English and Spanish, with the questions initially being asked in English and then translated into Spanish, and students choosing to answer in either language. Interviews were recorded with the permission of participants. As for the initial study, I had prepared a list of questions to be covered (see Appendix 8), similar to those in the questionnaire. Depending on students' answers, I changed the order of questions, invited participants to expand on particular points or asked additional questions not included on the original list.

3.5.6 Analysis of Interviews

In all cases, the interviews were recorded on a voice recorder, transcribed and, where necessary, translated into English. The contents were then searched for comments made by teachers and students that could provide insight on the learning experience and add an extra layer of detail to the data generated from the questionnaires.

3.5.7 Questionnaire procedure

In the main study, I distributed a questionnaire (see Appendix 7) in both schools in an effort to compare their experience of the CLIL lessons. The questionnaire was designed to be quick and easy to complete for the students and required them to circle a number between one and five indicating agreement or disagreement with a series of statements. The questionnaire contained both positive and negative statements about the course in an effort to avoid leading students towards a positive view. Although the questionnaire was written in graded English, students were invited to answer the open question 'What is your opinion of studying a subject like science in English?' in English, Catalan or Spanish, to encourage maximum participation. Students could choose to write their name on the questionnaire or remain anonymous.

The questionnaire was given to students to complete in early June 2009, a few weeks before the end of the academic year. Albert's group completed them in class, so all 19 students who attended that day handed in a completed form. Maria's group were given the questionnaire and told to complete it for homework and hand it in the following week. As a result only nine were handed in, and this low number could indicated that only the most cooperative students had chosen to complete the form.

In the follow-up study in 2012, I gave a questionnaire (see Appendix 11) to everyone in Maria's current *bachillerato* science group. The pupils who had participated in the CLIL programme of 2008-2009 answered a series of open questions about their experience, and there was a section on attitude to learning for all pupils, in which they circled a number to show how much they agreed with each statement. This time, I chose to write the questionnaire in Catalan, to make it quicker and easier for pupils to understand the questions and write their answers.

3.5.8 Analysis of questionnaires

The survey data from the questionnaires were analysed quantitatively and the results presented in tabular form. The answers to questions on opinions of the learning experience were cross-referenced with answers to questions on the language spoken at home, the school they attended and attitudes to English and Science as school subjects to gain a picture of which students had the most positive experience of the CLIL classes.

The open questions were translated into English where necessary, and examined to find any interesting comments that could add to the broad findings of the survey. In addition, these comments were categorised into five groups of very positive, positive, neutral, negative and very negative to check that they matched the answers given in the other part of the questionnaire.

3.5.9 Classroom observation: procedure

I recorded my observations in a series of notebooks. For each lesson, I noted the teacher, the date, the number of students, the perceived lesson aim and the setting (laboratory or classroom). I did not complete an observation pro forma, but made notes on the stages of the lessons as they progressed. In particular, I commented on aspects of the lessons that would not appear in the transcripts such as the teacher using the board or body language to explain ideas. I also made notes on how the students were participating in tasks. Because I had a dual role in the CLIL lessons as a teaching assistant, I would often move around the classroom while students were participating in activities and ask them questions about what they were doing and answer any questions that they had. As a result, I had less available time to write notes in the CLIL lessons than in the L1 lessons. When I produced my lesson transcripts using the audio recordings, I used my notes to add details, for example, to note when a teacher pointed to a piece of equipment or wrote notes on the board.

3.5.10 Curriculum/task (content) analysis: procedure

In order to analyse the curriculum and tasks on this course, I compared the Catalan version of the dossier produced by Maria (Appendix 12) with the English version (Appendix 10) to see how the content had been adapted to suit the English proficiency of students. At the same time, I developed a content analysis checklist to assess systematically the extent to which good practice CLIL was used in lessons

Based on my understanding of good practice CLIL (see chapter 2), I included the following items on my checklist:

- the level of cognitive challenge (defined as low, medium or high)
- the difficulty of the content (defined as low, medium or high)
- opportunities for communication (in groups)
- opportunities for communication (whole class)
- the inclusion of a cultural aspect to lessons
- interactive materials: video clips, practical activities, etc.
- multi-modal input: visual materials, texts, maps, etc.
- Task-based learning

The lessons analysed in this way were the same as those included in the SETT analysis (see table 3.9).

3.6 Course design

In the main study, in both schools, the lessons took place between September 2008 and June 2009, the entire academic year, and consisted of three one-hour classes each week. Twice a week, the whole group of 30 students in each school studied together and covered more theoretical topics, and once a week, they were divided into two groups of 15 students for practical activities and experiments.

The 2nd year of the ESO natural sciences curriculum covers physics and chemistry, and includes topics such as solids, liquids and gases and heat and temperature. Maria had been teaching for several years and had a number of dossiers prepared in Catalan, which she adapted and translated into English after attending the CLIL course in Nottingham. She favoured hands-on experiments for students, and a typical lesson would involve setting up an experiment and eliciting from students what they thought the outcome would be, for example, if a rock would sink if it was put in a beaker of water. She would then let them conduct the experiment, and round up by discussing what happened and why. Students would then draw illustrations of the experiment, complete charts and write up the conclusions.

Maria was concerned that learning in English could reduce the cognitive challenge for students and, as a result, she was opposed to using EFL-style communication games and activities in class, which she thought took away from the serious business of teaching science. In the interview she said ‘my aim is for them to learn science and not be playing around with these strange things'...'spending time on doing a crossword or doing a game, that's not for me'.

Despite this resistance to 'playing around', the Heat unit (Appendix 10) which covered five hours of classes, was adapted by Maria and myself to include some CLIL activities based on Coyle's 4Cs framework (1999). Therefore, Maria included activities such as expert groups tasks to encourage student-to-student interaction in English.

Albert did not have access to printed materials as the basis of his lessons (until Maria's Heat unit, which he used in the final term), but adapted his style of teaching to take into account his students' limited knowledge of English. For example, he encouraged students to keep a vocabulary notebook, which they would periodically review in class. In the interview, he said he taught science in English differently to science in Catalan by emphasising comprehension and oral communication, which he achieved through the use of expert groups or dictogloss tasks. For example, in one observed class, students were divided into groups of four or five and given a paragraph in English to memorise between them. They then moved around the room sharing the information they had remembered, before completing a chart.

Albert admitted that he did not have time to prepare classes based on the 4Cs framework. Although his classes involved fewer hands on activities for the students, Albert conducted the experiments himself in class so students could see for themselves the effects of science at work. The use of English as the medium of instruction was inconsistent in both schools. While both teachers had the intention at the beginning of the academic year of using English throughout the course, limited access to English-language materials coupled with time pressures meant that they frequently taught a lesson entirely in Catalan or in a combination of the two languages. Although there was a considerable amount of group work in both classes, both teachers relied heavily on triadic dialogue in a whole-class, teacher-led setting to clarify key points.

Chapter 4. Initial study: results and discussion

4.1 Pupils' levels of English

In the initial study, I was more concerned with pupils' learning outcomes than learning processes. In particular, I wanted to know how a CLIL course would affect pupils' levels of and confidence in their English. The two types of data I collected, gave quite conflicting results. In the questionnaires, interviews and learner evaluations, pupils reported that their English levels had improved as a result of the course, particularly in terms of their speaking. However, the English results I gathered did not reflect this positive view.

In the questionnaire (Appendix 2), I asked students how they thought their English had changed during the progress of the course. Of the 11 students who completed the end of course questionnaire, nine agreed and two strongly agreed with the statement 'I can now understand more English than I did at the beginning of the course'. In addition, nine agreed and one strongly agreed with the statement 'I now feel more confident speaking in English than I did before the course'. These attitudes are reinforced in the section where pupils described in their own words how they thought their English had been affected by the course. Six pupils said that their speaking had improved, giving additional details that they could speak more quickly, more spontaneously and with more vocabulary.

The students I interviewed (see case studies at the end of this chapter) were also mostly positive about their improved speaking skills. Gonzalo said that before the course he would not have been able to hold a conversation in English, but by the end of the course (and the taped interview shows this to be the case) he could. Gemma was concerned that her English was getting worse because she was involved in a French exchange programme, but she was sure her vocabulary had got better as she had learnt new technical words related to the subject. Carles also thought that his speaking had improved. Before the course he said he could speak English, 'but not at this level' and he added that by the end of the course he had more vocabulary and better pronunciation. None of the students mentioned other skills or grammar as an area of improvement in the questionnaires or in the interviews. Marina, for example, said she found it less difficult to speak as a result of the course, but her grammar level had stayed the same.

In contrast, the data collected to assess students' performance in English does not show any improvements in students' performance (see table 4.1). I had hoped that students' increased confidence in the language would be reflected in the marks awarded by their English teacher at the end of the spring term. Unfortunately, of the 29 students in the study, 12 obtained higher marks in English, two stayed the same and 15 got a lower mark. One of the main problems with these marks was that they were not based on objective data; they were based on a progress test, project work and the opinion of the teacher. A further problem was that the marks were not awarded by the same teacher, because the students' English teacher went on maternity leave at Christmas. For the first few weeks of the spring term, students had two supply teachers, and a new permanent teacher arrived halfway through the term. As a result, the two sets of English marks are not really comparable. In hindsight, a more effective way to assess pupils' levels would have been to use standardised tests, like in Lasagabaster's study of students in the Basque Country (2008), which used the Oxford Placement Test.

Table 4.1: English and Geography marks (a combination of exam, course work and attitude) at Christmas and Easter.

	English marks			**Geography Marks**		
Student no.	**Christmas**	**Easter**	**Difference**	**Christmas**	**Easter**	**Difference**
1 (Marina)	9.8	9.7	-0.1	9.9	10	+0.1
2	9.2	9	-0.2	9.9	10	+0.1
3	9.2	8.2	-1	8.4	8.1	-0.3
4 (Gemma)	9.1	9.3	+0.2	9.7	10	+0.3
5	9	7.9	-1.1	7.4	8	+0.6
6 (Rodrigo)	8.8	8.9	+0.1	8.4	6.2	-1.8
7	8.7	8.2	-0.5	8.4	5.3	-3.1
8	8.6	6.4	-2.2	8.8	6.3	-2.5
9 (Isabel)	8.3	8.3	0	9.1	10	+0.9
10	8	7.8	-0.2	8.5	6.7	-1.8
11	7.9	8.5	+0.6	9.9	10	+0.1
12	7.8	5.9	-1.9	7	5.7	-1.3
13	7.4	4.5	-2.9	8.9	7	-1.9
14 (Gonzalo)	7.2	4.7	-2.5	7.7	6.7	-1
15 (Carles)	6.8	7	+0.2	8	6.4	-1.6
16	6.8	8.3	+1.5	7.2	7	-0.2
17	6.8	6.6	-0.2	7.3	7	-0.3
18	6.6	7.3	+0.7	7.3	6.1	-1.2
19	6.6	6.3	-0.3	7	5.3	-1.7
20	6.6	6.6	0	7.3	6.1	-1.2

	English marks			Geography Marks		
21	6.4	4.6	-1.8	7	5	-2
22	6.2	5.9	-0.3	8.1	4.7	-3.4
23	5.9	6.3	+0.4	6.9	4.7	-2.2
24	5.6	5.2	-0.4	7	6.1	-0.9
25	5.4	5.6	+0.2	6.8	5	-1.8
26	5.3	5.6	+0.3	6.6	7.2	+0.6
27	5.3	5.4	+0.1	7.1	5	-1.9
28	5	5.2	+0.2	5.2	5.2	0
29	3	5.2	+2.2	6.6	9.6	+3
Mean	7.2	6.8	-0.4	7.8	6.9	-0.9

Note: improved marks indicated with green. Red indicates the same mark

4.2 Pupils' understanding of the content

The data I collected to assess pupils' knowledge and understanding of geography was similar in format to the data I collected about their English. I asked pupils to assess their own progress in the questionnaires, interviews and learner evaluations, and I also had access to their exam results and the marks they were awarded at Christmas and at Easter. Students' attitudes to how much content they learnt differed quite widely. Overall, responses to the questionnaire indicate that pupils found it more difficult to study geography in English, and they believed they would have learnt more if they had learnt the subject matter in Catalan. For example, five of the 11 respondents to the questionnaire said it was more difficult to study geography in English than in Catalan (see table 4.3), while only two students disagreed. At the same time, five students agreed that they learnt as much geography in English as they would have done in Catalan, with four more neither agreeing or disagreeing with this statement.

The case studies give more detail on students' attitudes to learning geography in English and how they evolved during the course. Rodrigo wrote in his first evaluation that he thought he would learn more geography by studying it in Catalan, but this view had changed by the time of the end of term questionnaire when he strongly disagreed with the statement 'It was more difficult to learn geography in English than in Catalan'. In her interview, Gemma said that she had learnt more content on the course because when she studied in English she translated the words and this helped her remember them better.

Gonzalo thought he had learnt a ‘little less’ content on the course, but overall he had learnt more, ‘because we learnt *sociales* (social science) and English’.

Students were tested on their knowledge and understanding of the content twice during the course, and the majority of students performed better in the second test (see table 4.2). Of the 25 students who sat both tests, 17 got a higher mark for the second test, one got the same mark and seven scored lower. In the first test, six students failed, with marks of less than 5 out of 10. In the second test, no one failed, with all students obtaining at least 6 out of 10. The proportion of students receiving marks of 9 and above remained steady at 23 and 25% respectively (see Charts 4.1 and 4.2). The exams were almost identical in design with students asked to answer multiple choice questions, compete a gap fill with key vocabulary, and write short essays (see Appendix 6). In addition, before both exams students were given a unit summary and a glossary to use for revision. One key difference between the exams was that Juan and I organised a revision class before the second exam, and this may have put the students who always study for exams and those who do not on more of an equal footing.

The marks awarded for geography by the course teacher, Juan, are similar to the English marks in that they show a drop in grade for the majority of students (see table 4.1). 20 of the 29 obtained a lower end of term mark at Easter, while one stayed the same and only eight showed an improvement. Again, these marks were given for attitude and participation as much as for the quality of the work produced. Several students who obtained very good results in the exams were awarded a very low end of term grade by the teacher. For example, Student 7 got an 8.2 and a 7.7 (out of 10) in the exams, but only a 5.3 in his end of term report. Juan told me he had given this student a low mark to reflect his poor attitude and participation in class.

As well as the end of unit exams, students worked towards an end of term project to create a Powerpoint presentation on immigration in Catalonia. Two classes were dedicated to students creating their presentations in the computer room and the final hour of the course was devoted to students presenting to the rest of the class. For the most part, the strongest students (those who had obtained the best exam results) produced the best presentations, but there were others who had not performed well in the exam but who produced (in the opinion of the teachers) excellent work when given this more flexible format. In ‘Assessing Integrated Language and Content instruction’, Short (1993) advocates the use of alternative assessment measures such as checklists, portfolios, interviews and performance-based tasks to overcome the problem of trying to isolate one feature (language or content) from the other.

Table 4.2: Student results in end of unit geography exams. The Globalisation exam occurred half way through the spring term and the Organisation of space exam took place towards the end of the term.

	Globalisation exam	Organisation of space exam
Student number	wk 5	wk 7
1 (Marina)	9.8	9.5
2	9.8	9.1
3	9.2	9.6
4 (Gemma)	9.3	9
5	8.2	8.2
6 (Rodrigo)	8.6	9.8
7	8.2	7.7
8	7.2	7.4
9 (Isabel)	9.7	8.8
10	no data	8.4
11	9.2	8.1
12	6.5	7.3
13	7.1	7.8
14 (Gonzalo)	5.2	6.7
15 (Carles)	7.1	8.9
16	4.4	6.6

17	4	6.8
18	7.5	no data
19	4.6	6.9
20	no data	6.1
21	8	7.2
22	5.3	7.7
23	4.3	8.8
24	8.2	9.1
25	4.7	6.1
26	6.1	8.2
27	4.1	6
28	no data	9.2
29	7	8.7

Chart 4.1: Globalisation exam grades

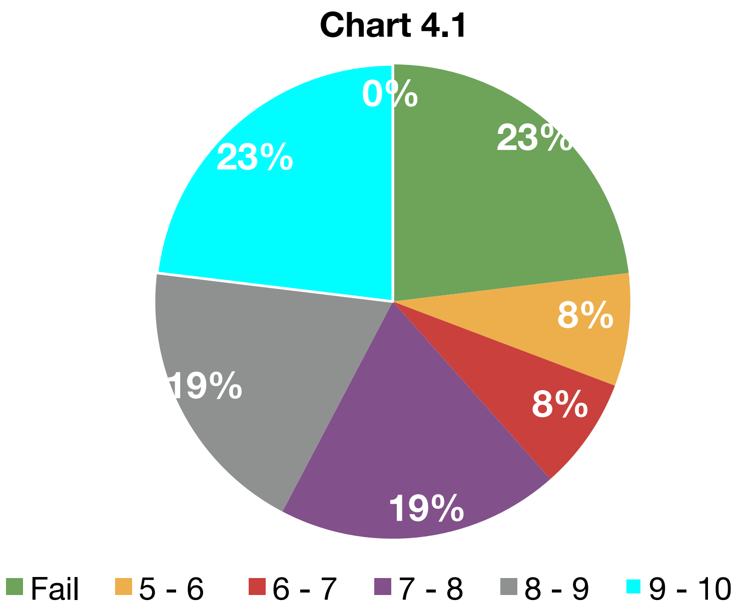
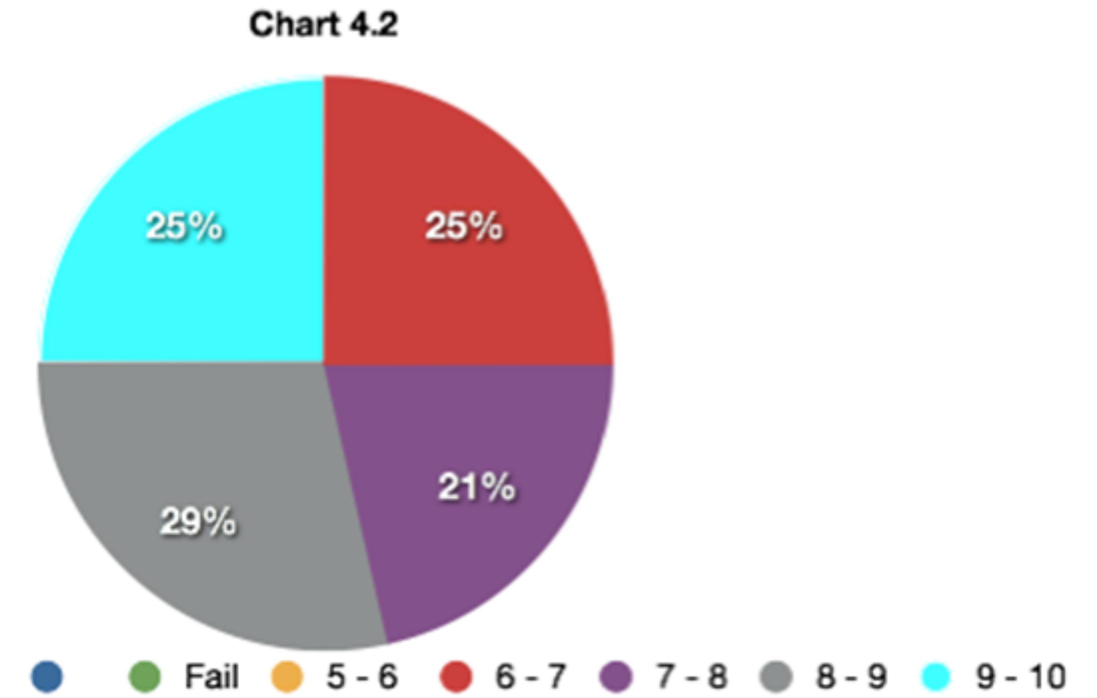


Chart 4.2: Organisation of space exam grades



4.3 Learning experience

As well as examining learning outcomes, I wanted to trial a communicative and task-based approach with pupils to see if it was effective in developing pupils' language skills and understanding of the subject matter. My choice of approach was based on my understanding of the 4Cs (Coyle, 1999). In addition, as a TEFL-trained teacher and teacher trainer, I believed in the importance of letting students do most of the talking, developing learner autonomy and appealing to students' learning styles and multiple intelligences (Gardner, 1983). Although I had several years classroom experience with this age group, I had always taught English to groups of no more than 14 students at a time. Early on in the course, Juan told me that he had concerns about the task-based approach, commenting that he did not think the students would be able to adjust to it, and I would have to switch to an instructor-led format. He was particularly concerned that a group of 30 students could not be controlled in a class of this type.

This issue of pupils adjusting to the format of the course emerged in the evaluations that students completed at weeks 3 and 7, and in the end of course questionnaire where they were invited to comment in their own words on the experience. The majority of students perceived the classes to be 'fun'. Many students referred to the 'games' they were playing, though in reality they were participating in tasks such as information exchange activities and reading galleries, where a text was displayed with images on the walls, and students answered comprehension questions. Some students responded positively to the new way of learning. One wrote, ‘geography is funnier (more fun) because we take part of the class in a more active way’. Another wrote, ‘I have enjoyed with all the plays (games) that we do in class, with maps, photos, etc.’.

Another student thought that this approach meant the group was ‘more dispersed’ and this may be an obstacle to learning. In his first evaluation, Carles complained that all the speaking meant the lessons were ‘annoying’ and he couldn’t pay attention. However, by the time of the second evaluation, he was more positive and said he found this style of class ‘more fun and great’. Marina thought that the teacher-led approach favoured by Juan was more direct and made it easier to learn. In her interview, she said that most students were more ‘comfortable’ with Juan’s approach, but she added that she had found it just as easy to learn, and it was the other students who found it more difficult.
Students universally approved of the maps, charts and visuals used during the classes. Isabel thought geography was a very suitable subject to study in English because of the maps and visuals to help explain concepts. The activities in the computer room were also very popular. The most popular activities, according to the questionnaire, were the refugees debate and the webquests, while tasks with the maps, charts and visuals and the unit summary were considered to be the most useful. Less popular were the Powerpoint quizzes, which perhaps did not involve enough student interaction, and the English to Spanish vocabulary games. These were introduced midway through the course as students would often ask for the Spanish translation of a word. Some students enjoyed the mingle activities, but not everyone, and from a classroom management perspective it was quite difficult to control.

Several students commented that the speaking activities had helped improve their speaking, though Carles thought that if they did not talk so much they would learn more. Isabel and another student writing in the evaluations asked for more theory alongside the speaking activities and discovery tasks, while another suggested some quiet time with the books.

Throughout the 30 classes, student participation was very high. For the first few weeks it was difficult to get students' attention after a task, and Juan was concerned that they were not working, but 'messing around'. After a few weeks though, he told me that they had become used to the new 'rhythm' of the classes. The use of Catalan in the class reduced over the weeks. In the recorded refugees debate (see Appendix 5), students spoke almost exclusively in English, often using the useful language provided. For example, in extract 4.1 (below), we can see Alex, Alvaro and Hector using the phrases 'In my opinion' and 'exactly', which were on the handout in front of them.

Extract 4.1: Axel, Alvaro and Hector

1. should immigrants have free education, healthcare and dole? Albaro?
2. no no Aleix.. in my opinion, I think so too
3. I think that immigrants should have free healthcare, education and dole.. la dos //both//
4. In my opinion er no.. only Spanish people have free healthcare and education question number 2.. listen and point.. should immigrants to Spain have to learn Spanish?
5. yes I think yes.. it's an obligation
6. exactly

In the following lines however, the students start using their own constructions to debate, mixing them up with the ones provided.

Extract 4.2: Axel, Albaro and Hector

1. three.. should immigrants to Catalunya have to learn Catalan? er.. I don't think that yes it's an obligation yes yes it's an oblgation of obligation
2. should immigrants to Catalunya have to pass a citizenship test e.g. know about the history of Spain and Catalunya?
3. I think that not
4. I think yes they have.. in my opinion yes they have

English also became the language of the classroom and students would use it to ask permission to leave the room and to request help from their peers. For example, in extract 4.3, one of the students asks another student to explain a word, but asks in English, rather than defaulting to Spanish or Catalan. She then, also accepts the answer in English, saying 'oh alright' instead of '*vale* //ok//', which I might have expected.

Extract 4.3: Maribel, Carlota, Guille, Isabel

1. all citizens should obey the laws of their country
2. I think that its its correct because its...
3. What does it mean obey?
4. obey.. *obedecer*
5. oh alright

Table 4.3: Questionnaire part 1 results

	I can understand more English than I did at the beginning of the course	I feel more confident speaking in English than I did before the course	It was more difficult to learn geography in English than in Catalan	I'd like to study more school subjects in English	I learnt as much geography as I would have if we had studied in Catalan
anon 1	4	4	3	3	5
anon 2	4	4	2	3	4
anon 3	5	4	3	3	1
student 2	4	4	4	4	4
student 3	4	4	4	3	3
student 4	5	4	3	2	1
student 7	4	4	1	3	5
student 11	4	4	3	3	3
student 12	4	3	4	3	3

student 13	4	4	4	4	4
student 28	4	5	4	1	3
1 = strongly disagree	2 = disagree	3 = neither agree nor disagree	4 = agree	5 = strongly agree	

Table 4.4: Questionnaire part 2 results

	What can do you in English that you couldn't do before?	What did you most enjoy about the course?	What did you find most difficult about the course?	How did you study for the exams? Comment on which materials you used (the course book, handouts from class, the unit glossary and summary)	Is there anything else you would like to say about the course?
anon 1	speak more	the debates	speak English	summary	very interesting
anon 2	can study better in English	Learn much words in English	Study to the exams	the summary, glossary and dictionary	it's an an amazing and unforgettable experience
anon 3	speak all the time in English and memorise things in English	English	Memorising things in English	1st read the book in Spanish and then read the summary	
student 2	This special class	The powerpoint classes and the concours (competition)	The exams	I study with all	I like it, but I would like to do the things that we do, and more teory.

	What can do you in English that you couldn’t do before?	What did you most enjoy about the course?	What did you find most difficult about the course?	How did you study for the exams? Comment on which materials you used (the course book, handouts from class, the unit glossary and summary)	Is there anything else you would like to say about the course?
student 3	I can speak more quickly and with more vocabulary	I enjoy all the classes in general because all the classes are different than the other asignatures (subjects)	The exams	I read the summary	no
	What can do you in English that you couldn’t do before?	What did you most enjoy about the course?	What did you find most difficult about the course?	How did you study for the exams? Comment on which materials you used (the course book, handouts from class, the unit glossary and summary)	Is there anything else you would like to say about the course?
student 4	Nothing	the webquests	the powerpoint of globalisation	the glossary and summary	Yes, all was very funny!
student 7	I can speak more spontaneously and with more vocabulary	The classes in the computers room	The last unit about immigration and organisation of space	I revised the exercises that we did in class and the summary and glossary	I’ve enjoyed it has been a different thing

	What can do you in English that you couldn't do before?	What did you most enjoy about the course?	What did you find most difficult about the course?	How did you study for the exams? Comment on which materials you used (the course book, handouts from class, the unit glossary and summary)	Is there anything else you would like to say about the course?
student 11	I can speak better in English and to express better	Go to the computer room	The globalisation	With the glossary and summary	Not. For me all is good
student 12	speak more	the debates	speak English	with summary	that is very interesting
student 13		I enjoy because we do some plays (games)	the most difficult is study the exams	with the summary	It's a fantastic experience and you are a fantastic teacher.
student 28	Speak with a native English people	Computers classroom	Learn vocabulary	I looked the glossary and learn the vocabulary	

4.4 Case studies

Below are the case studies I wrote about six students who participated on the course. As I mentioned in the methods chapter, they were chosen on the completeness of their data set.

Student case study 1: Marina

Marina is a bright and outgoing student who sat near to the front of the class and was always quick to raise her hand and volunteer answers. During the classes taught by Juan, she was one of the most participative students and this continued with me in the spring term. Marina has a B2 level of English and studies two hours a week at a private academy. She said she is studying for the Cambridge First Certificate (B2) exam.

During the two months when Marina studied geography with me, she said she thought her speaking improved: ‘I think that now I am able to speak more and it's less difficult to me to speak because these two months to talk to you was in English’. She also said that she learnt new vocabulary, but her grammar remained the same.

Marina was the most vocal of all the case study students on the subject of the different teaching methods used by the native English teacher. At the beginning of the interview she said that she found the course interesting and was happy because she learnt many things, however she then commented that the class was difficult because the system was so different to what she was used to. She said that in Juan’s classes where the teacher addressed the whole group it was more direct and easy to learn. However she seems to attribute this problem to other students, saying she was confident that she had learnt as much in the task-based classes as in the teacher-led ones. When asked which system was most effective for her she said she thought they were the same, but that other learners wanted the ‘blackboard’ (teacher-led) system as it was more ‘common’ and students felt more ‘comfortable with it’.

Exam results. 97.5% in the globalisation exam and 95% in the organisation of space exam. Her English marks (based on a combination of end of term exam, attitude and participation, and project work) were 98% in December and 97% in March, and for social sciences they were 99% in December and 100% in March.

Student case study 2: Carles

Carles is a quiet and hard-working student who participated well in written work, but less so in class. He has a B1 level of English and has never studied in a private academy, so just does the standard three hours a week of English at school. Initially Carles did not seem to think very much of the teacher or the course, and had no qualms about expressing his criticisms. In his first evaluation recorded three weeks into the lessons he said ‘the class is annoying so I can’t pay attention’ and ‘we (me and the class) don’t want to do anything.' However by the time of the next evaluation at seven weeks, Carles was much more enthusiastic saying the type of class was 'more fun and great' although still commenting that 'maybe if we didn't talk too many we learnt a lot more'.

In the interview, Carles was positive that his English had improved as a result of the course. He said that before the course he could speak English, 'but not at this level' and by the end of the course he had some words and better pronunciation. On the subject of the different teaching methods of the teachers he said that Juan was a more practical teacher who always used the book, whereas in the course with the native teacher there were more activities and it was more interesting that the normal course.

Exam results: 71% in the globalisation exam and 89% in the organisation of space exam. His overall English mark improved slightly from 68% to 70%, however his overall social science mark dropped from 80% to 64%.

Student case study 3: Isabel

Isabel is a very enthusiastic and hard-working student who always participated actively in class. She is quite shy, though, and would often let her peers take over in a speaking activity. Isabel's attitude towards the course was very positive. She particularly enjoyed the activities with maps and Powerpoint as everyone 'can participate' (perhaps a reference to the fact that she is often dominated by her peers), although she thought that 'one day a week we ought to do theory, because before we play we can know something'. Isabel has a B1 level of English, and she thought that her English went up by a level during the course, particularly her speaking, though her grammar stayed the same. As well as doing the standard three hours of English at school, she also studies at a private academy with a native teacher where they do a lot of speaking activities. She seemed to think that geography as a subject was a suitable subject to study in English because of the maps and visuals to help explain concepts. Studying natural sciences in English, in her opinion, would simply involve writing, while in social sciences the variety of activities and visuals made it easier.

Exam results: 97% in the globalisation exam and 88% in the organisation of space exam. Her overall English mark stayed the same at 83%, but her social sciences mark went up from 91% to 100%. (Juan's overall grades were quite subjective)

Case study 4: Rodrigo

Rodrigo is a very intelligent and communicative student who like Carles was quite dubious at first about learning geography in English. In his first evaluation, he wrote that he would learn more geography in Catalan, but he liked to do the classes in English as he learnt a lot of vocabulary. This view had changed by the final questionnaire where he marked 'strongly disagree' for 'It was more difficult to learn geography in English than in Catalan'. Rodrigo adapted very positively to the change in classroom culture that occurred between Christmas and Easter. In his interview he commented that 'we weren't all the time listening at the teacher and taking *apunts* (notes)' and he enjoyed the classes because the students had to talk all the time and do activities. He thought that his level of English improved during the course as a result of the speaking activities 'I can speak more spontaneously and with more vocabulary', and that he learnt as much geography in English as he would have done in Catalan. In particular, Rodrigo liked using maps and charts, as they helped him see clearly, and the activities in the computer room.

Exam results: 86% in globalisation and 98% in organisation of space. English results 88% at Christmas and 89% at Easter. Social sciences 84% at Christmas and 62% at Easter.

Case study 5: Gonzalo

Gonzalo had a relatively low level of English (A2) for the group, though this did not prevent him from participating actively in class. He adapted enthusiastically to the changed classroom dynamics and wrote in the end of course questionnaire that he enjoyed how different the classes were from those in other subjects. Gonzalo had the most positive impression of his improved level of English. He said that before the course he could not have a conversation in English, but by the time of the interview he could. He also thought that although they learnt a little less content in the course than they would have done in English, they actually learnt more overall. 'I think we learnt more in English because we learnt socials and English'. Gonzalo's contribution to the speaking activity also reflected his enthusiasm for speaking, despite not having as good a level as his peers. As well as using the useful language provided, Gonzalo added his own language such as ‘give me five’ to show agreement. When asked where he knew this phrase from, he thought he had got it from watching films rather than English class.

Exam results: Globalisation: 52% Organisation of space: 67%. His English results surprising went down considerably between Christmas (72%) and Easter (47%). His social sciences grade also dropped from 77% to 67% over the same time.

Case study 6: Gemma

Gemma is an outgoing and bright student who mixed well with her classmates and always participated actively in class. She studies more English than most students (four hours in a private academy in addition to the three at school) so I was surprised when she said in the interview that her English had got worse over the previous months. ‘I say that my English isn’t good because now I’m doing an exchange with some French girls and when now I try to speak in English I speak in French’. She does think her vocabulary improved in terms of ‘technical words from *sociales’* and she had a very positive impression of studying geography in CLIL thinking she actually learnt more. ‘I think that I learn more in English cause when I study it in English I have to *traduce* ((translate)) some words and it’s good because if I translate I remind more the words and it’s better’. Gemma adapted well to the varied activities and interaction patters and particularly enjoyed the kinaesthetic activities: ‘it was so different because all the class was stand up and you were moving on the class looking for photos and speaking a lot and not sitting down in a boring chair and doing some exercises’. She also commented in the questionnaire that the tasks with the maps, charts and graphs were the most interesting and useful. One criticism she made of the course, echoing Isabel’s comments, was that she would like to do more theory.

Exam results: globalisation: 93%, organisation of space: 90%. English 91% at Christmas and 93% at Easter. Social Science 97% at Christmas and 100% at Easter.

4.5 Conclusion

The initial study did not generate the sort of data I had hoped for in terms of showing improvements to pupils' English levels. While pupils told me that they thought their speaking and vocabulary had improved, the lack of rigorous testing means there is no quantitative evidence of this. Furthermore, even if I did have test results that showed an improvement in pupils' English levels, it would be difficult to say this CLIL course was the reason for the improvement. Pupils continued to study English for three hours a week in school, and many also studied up to three hours a week doing *extraescolar* English in private academies and after-school programmes.

In terms of content learning outcomes, pupils again reported, after some initial misgivings, that they thought they had learnt as much content in English as they would have done in Catalan. There is some evidence for this in the exam results, since all the pupils in the group passed the second exam, which could indicate that pupils were getting used to the format of the lessons and had successfully learnt the content. Again, it is difficult to pinpoint the lessons as being the only reason why the pupils did well in the exam, since pupils could have made more effort to study, and the single revision lesson held before the exam may have been key to the high success rate, rather than the ten lessons that preceded it. A variety of testing and assessing methods, such as those proposed by Short (1993), would have been a more effective way of assessing pupils' ability to learn the content of the course.

Despite the lack of solid data to demonstrate learning outcomes, the initial study did show that pupils, normally used to transmission-style teaching, could adapt quickly and easily to a more task-based and communicative format. Participation in class was high throughout the course, and pupils' use of English increased as it progressed. Their attitudes, which were mixed in the first evaluations, became more positive as they got used to the rhythm of the CLIL classroom. While some changes need to be incorporated into the next course, the study shows that the communicative and task-based approach can be used with a large group of Catalan teenagers without the predicted loss of discipline and learning.

Working on the initial study made me conscious of the difficulty in obtaining reliable results to show learning outcomes. It also made me realise that, even with more rigorous testing, it would be difficult to show a direct link between one CLIL course and pupils' ability to pass exams, since so many other factors, such as pupils' own motivation to study or other English lessons, could account for any improvements. As a result, I decided that for the main study, I would focus more on learning processes than learning outcomes. In the summer between the initial study and the main study, I read Dalton-Puffer's 2007 research into Austrian classrooms which gave me the idea of recording and analyzing lesson transcripts as a research instrument.

The initial study also made me realise that by teaching the lessons myself, I was less able to observe what was happening in the classroom. It was an artificial experience for students too, since I did not have any experience or training as a geography teacher. I tried to compensate for this by spending hours planning my classes and creating lesson plans and materials that I hoped would inspire and motivate my students, but it is very likely that this course was not very representative of the sort of CLIL lessons that were happening in schools around Catalonia. If I wanted to find out about CLIL in Catalonia, then it would be better for me to seek out schools that were already teaching CLIL and get access to their classrooms as an observer.

Chapter 5: Results and discussion: a comparison of Maria's L1 and CLIL lessons

In the next three chapters, I present and discuss the results of the main study, which took place in schools in El Raval, in central Barcelona, and in La Garriga, a small town several kilometres away. Since I had recorded transcripts of Maria teaching in both her and students' L1 and in English, her lessons from the main data in the study. In chapter 6, I compare Maria's lessons with the other three teachers in the study, Albert, Joanna and Belén.

In this chapter, I look at the transcripts from science lessons taught by Maria to her 2nd of ESO (13-year old) students in both Catalan and English over the course of an academic year. Maria had already been teaching CLIL for one academic year, and the first lesson I observed was in November of her second year as a CLIL teacher. In the initial study, I had taken centre stage, designing course materials and teaching the lessons. This time, I was involved as a researcher and occasional teaching assistant. This, and the fact that I recorded the lessons, gave me more opportunity to observe what was happening.

5.1 The SETT Framework

As I have already outlined in chapter 3, I chose to use the SETT (Self-evaluation of Teacher Talk) Framework (Walsh, 2006) as a starting point for my analysis of classroom transcripts, with the aim of developing a broad interpretation of the discourse and interaction that took place.

The lessons

From the original 20 hours of transcribed lessons, I chose four (two conducted in English and two in Catalan) for analysis using this framework. These lessons were chosen for their similarity in format and each included at least one practical activity and some teacher-led discussion. The classes differ in the number of lines of transcribed dialogue, with the CLIL lessons containing considerably fewer. This is partly because students spent more of the lesson working in small groups completing worksheets and conducting experiments. Moreover, each line represents a speaker turn, and in the L1 lessons turn-taking was more dynamic, with students asking and answering more questions. In the CLIL environment, there are times when a turn continues in the hands of the teacher for several minutes without any student involvement. The word count (included in the table below) is a more reliable indicator of the volume of discourse than the number of lines, while the number of lines shows how frequently the turns change hands.

Table 5.1: Lessons included for SETT analysis

Name of lesson	**Date**	**Number of students**	**Topic**	**Language of instruction**	**Lines of discourse (turns) categorised into SETT modes**	**Word count in lesson**
Lesson 1	November 25 2009	12	Water particles	English	24	1057
Lesson 2	December 2 2009	12	Density of liquids and solids	English	74	1325
Lesson 12	February 17 2009	12	Light dispersal in water	Catalan	105	2585
Lesson 13	March 3 2009	14	Mixing solids and liquids	Catalan	148	2477

Outline of lessons

In lesson 1, students look at the speed of particles in hot and cold water by conducting an experiment in which they add drops of food colouring to beakers containing water of different temperatures. Maria gives instructions for the experiments in English and goes over the results with students before asking them to write up the results in a dossier. Most of the lesson is taken up with students conducting experiments in small groups and writing up the results.

Lesson 2 involves students conducting an experiment where different objects, such as a pumice stone, a sponge and a cork, are placed in a beaker of water to see if they float or sink. Later in the lesson, they add salt to a beaker of water to see how much is needed to make an egg float. The object of the lesson is for students to learn that solids are usually denser than water, but not always. In between the experiments, Maria uses the board and a printed handout to elicit and explain the results of the experiments. As for lesson 1, much of the class time is taken up with students working in small groups on experiments and completing notes. Maria conducted most of the lesson in English, though she frequently used Catalan to clarify points and repeat instructions. Working alongside Maria were a teaching assistant, Joanna, and myself, who both monitored students and asked them questions in English while they worked in groups.

In lesson 12, students participate in a practical activity to learn about the principals of light dispersion. The activity involves shining a laser at test tubes containing liquids such as milk, vinegar and water mixed with sand, oil and flour to see if the light passes through. This is followed up with feedback on the properties of emulsions and homogenous mixtures led by Maria using a handout. The majority of classroom time is spent in transmission-mode, although students ask more questions and make more contributions than in either of the CLIL lessons.

Maria, rather than the students, conducts the experiments in lesson 13, while students watch and ask and answer questions. Maria demonstrates mixing salt, sugar, small pieces of calcite and finally hydrochloric acid in a beaker of water, and elicits observations from students on whether the substances break down in the liquid. Most of the class time involves Maria eliciting and presenting information, with very little time spent in group work. Part of the lesson is conducted in transmission mode with the teacher using the board or the materials and equipment from the experiment to elicit answers, while at other times students work together in small groups.

SETT modes used in the lessons

To make it easier to identify the mode used in each line of transcript, I have used colour to show each SETT mode: red for managerial, blue for skills and systems, green for materials and orange for classroom communication.

Managerial mode

Managerial mode occurs frequently in both the L1 and the CLIL lessons to give instructions, round up activities, manage learners, switch between modes and summarise the main points of a discussion. In general, the instructions Maria gives in the L1 lessons are more concise than those in the CLIL lessons. They do not involve as many confirmation checks, and also tend to be chattier in nature. For example, in this extract from lesson 13, Maria tells students what they need to do for an experiment, and halfway through, she breaks off to remind students of the slogan from a Fairy liquid television advert.

Extract 5.1. Lesson 13 (Maria)

Line	Speaker	Catalan transcript	English translation
126	T	...doncs, avui el que anem a fer nosaltres, és una emulsió permanent, vale? i què farem? posarem aigua i oli poquet, perquè en tenim molt poc, vale? i li posarem una mica de sabó, no tot el sabó...heu vist aquell anunci del Fairy ‘que con una gota basta’, eh? doncs, una goteta. llavors, remanem...aviam, si voleu també podeu fer una cosa, per recordar com era ho barregem primer i després hi poseu el sabó, és igual, que cadascú ho faci com vulgui, vale?	...so now what we'll do is a permanent emulsion, ok? and how do we do it? we put water and a little oil.. because we only have a little, ok? and we'll get a bit of soap, not all the soap .. we have all seen that Fairy ad ‘one drop is enough’ eh? so a little drop.. and what's left.. so if you can do something to remember how it was mixed first and after you add the soap.. it doesn't matter, everyone wants to do it.. ok?

In contrast, in these instructions for a practical activity conducted in English in lesson 1, Maria uses a confirmation check to ensure students understand her, and repeats key concepts such as the need to fill the jar 'very very slowly'.

Extract 5.2. Lesson 1 (Maria)

LIne	Speaker	Transcript
4	T	fill three quarters of a big glass jar.. page 21 the one with the thermocline.. with cold water.. page 21 ((repeats in Catalan)).. do you understand that? Francesc.. do you understand? ok.. And then the most important thing of all.. we are going to fill the rest of the jar with hot water but very very slowly that's very very important. we will put the water very slowly ((repeats in Catalan))......... then we will divide the class into two groups ((repeats in Catalan)).. one group is going to be with Jane and Joanna and you are going to do the exercises ok

Maria repeats the most important information about pupils filling the jar with hot water slowly in Catalan, presumably because she wants to ensure that students are careful when they handle the hot water, but then she repeats the next instruction in Catalan as well. This tendency to repeat herself in the students' L1 is evident throughout the transcripts and is something I discuss in chapter 6 in the section on teachers' use of L1.

Maria uses managerial mode to manage learners and get them back on track in the L1 lessons. Students were more inclined to make unsolicited contributions and ask questions in the L1 lessons, and at times Maria needs to steer the group back on track. In this extract, skills and systems mode is being used to discuss the experiment of light shining through test tubes. Maria tries to answer student questions about the properties of light, before telling the group, in line 23, that this is something that they will understand by the end of the academic year, and moves them back on to the point she wants to make.

Extract 5.3. Lesson 12 (Maria)

Line	Speaker	Catalan transcript	English translation
21	S	la llum té a veure amb els electrons?	does light have something to do with electrons?

Line	Speaker	Catalan transcript	English translation
22	T	no, la llum no té a veure amb els electrons, és un altre tipus de partícula, vale?	no.. light doesn't have anything to do with electrons.. it's another type of particle.. ok?
		Es que és una mica complicat això, eh? Ja ho aprendreu, si ho apreneu tot ara a 2º d'ESO, llavors, que aprendreu després, vale?	this is a little complicated.. when you have studied everything in 2nd of ESO.. then you will understand it afterwards ok?
		Aleshores, ho heu entès això de que la llum no passa perquè es troba com uns 'parapetus'com si deguéssim?	then you have understood that light doesn't go through because it meets a shield like the one we saw?
23	SS	Sí	yes

This use of managerial mode does not feature in the CLIL lessons as students did not ask questions that could have moved the lesson off-topic.

In both the L1 and CLIL lessons, Maria at times rounds up materials or skills and systems mode with a summary of the discussion using managerial mode. These stretches of managerial mode are characterised by a single-extended teacher turn and an absence of learner contributions. For example in this CLIL lesson, Maria rounds up the experiment by asking students if they understand and repeating the key points.

Extract 5.4. Lesson 1 (Maria)

Line	Speaker	Transcript
20	T	now now.. class what happened? the molecules here.. the molecules here ((holds up a beaker)) cold water hide the molecules in the cold water.. the molecules go to one another and then the colour can go through //can go through// and in the other the molecules are moving and they are spread and the colour goes inside.. //here they enter and here they don't enter// ok?

She use a similar rounding up technique in her L1 lessons, although she is less repetitive in her language. In this extract, for example, Maria has finished explaining a point, but a student is unsure what to write on the handout.

Extract 5.5. Lesson 13 (Maria)

Line	Speaker	Catalan transcript	English translation
191	S	qué em de posar?	so what do I put?
192	T	a l'explicacio heu de dir.. qué heu de dir a l'explicació? que hem fet una emulsió permanent no? aió es diu emulsió permanent ((T comenta que ha de borrar alguna cosa de la pissarra perqué vol escriure una altra)) hem fet una emulsió permanent.. vale?	in the explanation you say.. what do you say in the explanation? we've made a permanent emulsion haven't we? this is called a permanent emulsion ((T says she has to rub something off the board because she wants to write something else)) we made a permanent emulsion.. ok?

Maria had not planned on giving this round up, but when asked to give one by a student, she repeats the key information (that they made a permanent emulsion) three times to make sure everyone has understood.

One difference between the CLIL and L1 lessons is that Maria provides more regular summaries in the CLIL lessons. In lesson 1, Maria summarises in line 8 and again in line 16, and in lesson 2, she reviews the main points in lines 38, 49, 51 and 61. Therefore, students do not wait longer than 13 lines between summaries. In lesson 12, however, Maria summarises in lines 7, 9, 23, 26, 52, 69, 71 and 105, so students are left 34 lines at one point (between lines 71 and 105) without receiving a recap of the discussion. Correspondingly in lesson 13, students are given a summary in lines 16, 27, 59, 93 and 124, so 34 lines exist at one point in the lesson (between lines 59 and 93) without a round-up of the main points.

There were more short managerial mode turns by the teacher in the L1 lessons as Maria switched mode more frequently. Managerial mode in both lessons involved some learner contributions as the teacher checked learner understanding of key concepts in the L1 lesson, and vocabulary in the CLIL one.

Materials mode

Materials mode occurs in much the same way in the CLIL and L1 lessons, when printed materials are used to elicit responses from learners, and when students are asked to make observations about an experiment that has just taken place or is being conducted. Discourse in materials mode is characterised by IRF patterns, extensive use of display questions and corrective repair. In this example, Maria holds up the materials used in the experiment to see which materials float and sink and asks students what they observe.

Extract 5.6. Lesson 2 (Maria)

Line	Speaker	Transcript
52	T	light it's light.. that's why it floats.. ((repeats in Catalan)).. everyone has understood that.. what happens with the sponge?
54	S	floats
55	T	it floats now you can see.. everyone has it completely under the water?
56	S	no

Line	Speaker	Transcript
57	T	try to sink it ok .. what happens… what happens? Its full of bubbles .. can you see? .. full of bubbles *mira mira* //look look// it's like beer you know

In both the CLIL and L1 lessons, Maria frequently departs briefly from the main mode (materials) to a secondary mode such as managerial or skills and systems, before returning to materials mode. These sequences are called 'mode side sequences' (Walsh 2011) and are a common feature of conversations involving speakers jointly constructing and negotiating a dialogue. In this extract, Maria switches first to skills and systems mode in line 49 to check student understanding of the term 'impermeable' and then in line 51, she provides a summary of the main points of the discussion, before returning in line 51 to materials mode to elicit more results from the experiment.

Extract 5.7. Lesson 2 (Maria)

Line	Speaker	Transcript
43	T	do you think that water is going inside the cork? do you think it's going inside?
44	S	no
45	T	no.. why not? why not?
46	S	is air there
47	T	is?
48	S	air.. because it's floating.
49	T	ah *si* //yes// very good very good.. do you know what impermeable mean?
50	S	*impermeable* ((in Catalan))

Line	Speaker	Transcript
51	T	the cork is impermeable. the water can't go inside.. ((repeats in Catalan)).. do you understand? why do they put it in the bottle? ((repeats in Catalan)).. it has no holes ((repeats in Catalan)).. no holes so the water cannot go in.. you do the drawing and you write.. no holes.. and is it light or is it heavy?

Skills and systems mode

Skills and systems mode is employed in a number of different ways in the lessons. The clearest cases are those when the students are not looking at a material, and the teacher is eliciting correct answers from them with the use of display questions, teacher echo and form-focused feedback.

Extract 5.8. Lesson 12 (Maria)

Line	Speaker	Catalan transcript	English translation
26	T	Nosaltres què vam fabricar la setmana passada al principi de la classe? Teníem oli i aigüa que, com van quedar posats?	what did we do last week at the beginning of the class? we had oil and water that.. how did they end up?
27	S	un a sobre de l'altre	one above the other
28	T	un a sobre de l'altre separats. Què va passar quan vam barrejar?	one above the other separated.. what happened when we mixed them?
29	S	que van quedar bombolletes	they turned into bubbles

Line	Speaker	Catalan transcript	English translation
30	T	que van quedar bombolletes d'una dins de l'altre, oi? I al cap d'una estona es van tornar a...	they turned into bubbles one after the other and after a while they became..
31	Ss	Separar	separated

In other parts of the transcripts, the appearance of skills and systems is less clear, for example, where materials are present, making the discourse appear as materials mode. According to Walsh (2011: 135), 'skills and systems mode typically follows a similar interactional organisation to materials mode. However, turn-taking and topic management may be less tightly controlled, and pedagogic goals are not derived from materials, but from teacher and learner agendas.'

In this next extract, students are going through answers on a handout, and the lesson is following quite a rigid IRF pattern in materials mode. When a student asks a question relating to the purity of copper sulfate, the turn-taking becomes less ordered and teacher-led, and the conversation becomes determined by the learner's agenda, rather than the material they are looking at. Therefore, I have classified lines 78-81 as skills and systems mode.

Extract 5.9. Lesson 12 (Maria)

Line	Speaker	Catalan transcript	English translation
73	T	Molt bé. A tothom li ha quedat clar això. La segona part, què diu? IlAlumineu també.	very good.. this has been clear to everyone.. what does the second part say? illuminate also...
74	S	Alumineu també els tubs s'assaig amb vinagre, llet i sulfat de coure. Què passa en cada cas? Per què?	also illuminate the tubes filled with vinegar, milk and copper sulfate.. what happens in each case? why?
75	T	aviam...no ha passat per quina?	it didn't pass through? which one?

Line	Speaker	Catalan transcript	English translation
76	Ss	per la llet	through the milk
77	T	per la llet. Perquè les altres com ha dit algú, són substàncies pures, són tot lo mateix.	through the milk.. because the other ones, as someone said, are pure substances, they are all the same.
78	S	però el sulfat de coure és pur?	but.. is the copper sulfate pure?
79	T	si, és una substància pura el sulfat de coure. Aleshores...	yes.. copper sulfate is a pure substance.. then...
		((diferents estudiants es posen a demanar a l'hora i no s'entén bé el que diuen))	((some students start to ask what the time is.. not easy to understand))
80	S	i l'aigua d'aixeta? Si fem servir aigua d'aixeta?	and the tap water? if we use tap water?
81	T	Molt bé. Si fem servir aigua de l'aixeta, com que l'aigua d'aixeta té tant poques partícules, la pobra, passa el mateix, Alba, que quan no havies remenat, vale? És a dir, no vol dir, que quan passa sigui una substància pura, vale? Però quan no passa si que vol dir què? Aviam, Paula...	very good.. if we use tap water with the tap water it has so few particles, the poor thing.. the same thing happens.. Alba.. what happens when you don't shake it? That doesn't mean that it happens with a pure substance.. but when it doesn't happen.. what does it mean? Paula?

Skills and systems mode often results from students taking the initiative to ask a question, moving the classroom talk away from the specific context of the material into a more general scientific discussion, that addresses their learning goals.

This situation of students asking more general science questions during discussion of a material does not occur in the CLIL lessons. What does occur is the teacher asking a question that goes beyond the demands of the material being looked at. So, rather than eliciting an observation or an answer written during an activity, students are required to explain why something has occurred in an experiment, rather than simply describing what they can see. In this extract, Maria is using a handout to go over the results of an experiment involving drops of food colouring in a beaker of cold water. In line 11, she moves into skills and systems mode to ask why the colouring stayed at the top of the beaker, to meet her pedagogic goal for the lesson about the distance between water particles in hot and cold water. Later in the same extract at the end of line 13, she switches back into skills and systems mode to check understanding of 'the dispersion and speed of the colouring', something that relates less to the material and more to the general learning outcomes of the class.

Extract 5.10. Lesson 1 (Maria)

Line	Speaker	Transcript
10	T	so.. lets go all together one moment to page 16 because I didn't remember to put the heating on. ((repeats in Catalan)) cap problema //no problem//.. ok go to page 16.. it says here we are learning about cold water page 16
11	T	why do you think the colouring remained in the top part of the beaker with the cold water? .. ok.. why? ..because the water particles of the molecules were more separated or closer to one another?
12	SS	Closer to one another
13	T	closer to one another.. perfect then we go to page 17 and it says.. as the particles move slowly the dispersion and speed of the colouring.. what does that mean? as the particles move slowly.. the dispersion and speed of the colouring?
14	S	//the dispersion and speed of the colouring//

15	T	exacta //exactly//

Classroom communication mode

This mode, which is characterised by extended learner turns and referential questions, did not occur at all in the CLIL lessons. In the L1 lessons, it occurs infrequently, and is used to establish a context. For example, in this extract, Maria asks students if they have a white limestone marble kitchen work surface at home. She does this to ensure that everyone is clear what limestone is before moving on to tell them that it does not dissolve in water.

Extract 5.11. Lesson 13 (Maria)

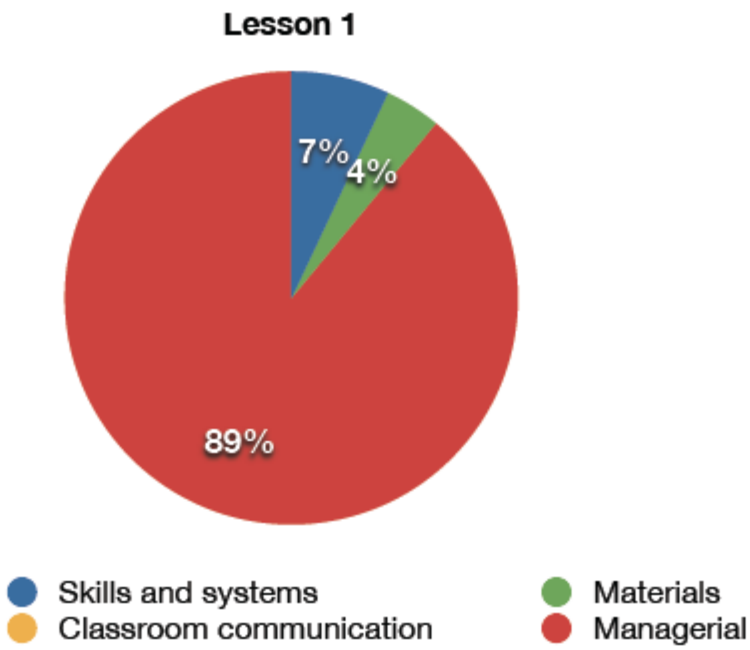
Line	Speaker	Catalan transcript	English translation
60	T	les roques calcàries....sabeu el marbre de la cuina? Perquè abans el marbres eren de color blanc. Algú té a casa de l'àvia o casa seva...	limestone marble.. you know the marble in the kitchen.. because before.. the marble was white.. does anyone have it at home or in their grandmother´s home?
61	S1	jo	I do
62	S2	jo, jo el tinc blanc	me.. I have a white one
63	T	aquests són els marbres de veritat, vale?	this is real marble ok?
64	S	no n'hi han ara	they don't have them now
65	T	si, ara ja no, veus? Et deus haver canviat als més moderns, et deus haver modernitzat. Eren marbres que eren de calcària, de calcita i, és clar, quan es posava llimona o vinagre...	yes.. not now, do you see? It's because we have modernised.. It used to be marble made of limestone calcite and of course when you put lemon or vinegar

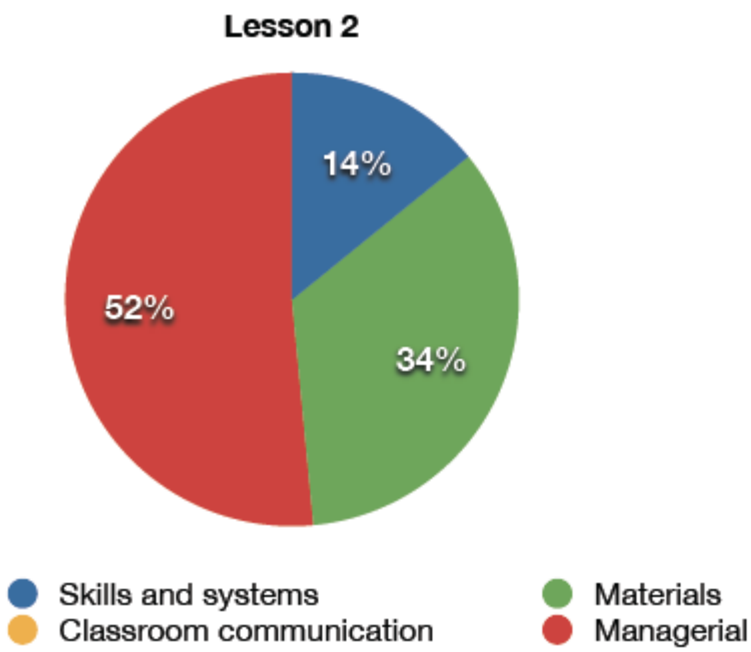
Line	Speaker	Catalan transcript	English translation
66	S	però, no era un blanc d'aquell, eh? ((suposo que S senyala alguna cosa blanca a la T per saber de quin tipus de blanc es tracta)).	but it wasn't white like that? ((I suppose S points to something white in the classroom)).
67	T	blanc així ((senyala alguna cosa de color blanc)), molt blanc. Deu ser més modern això, no és el blanc clàssic aquell que es tornava una mica groguenc.	white like this ((points to something white)) very white.. because it's more modern like this it's not classic white.. but it's become yellowish
68	S	és tipus blanc de (xxx)	it's kind of white of (xxx)
69	T	vale. Sabeu aquells que hi ha a la peixeteria a vegades? Què és com una cosa blanca? Aixó és marbre i, alló els àcids ataca. Per aixó ara a moltes cuines enlloc de posar alló posen el granit aquell que us vaig ensenyar.	ok.. you know when you go to the fishmonger sometimes? what is the white thing? this is marble and acids attack it.. this is why in many kitchens they put granite as I have said

The lack of examples of classroom context mode in the CLIL lessons could be due to the teacher wanting to control the classroom time more tightly to enable the learning aims to be achieved. Moreover, it could reflect an attitude that was revealed in the interviews with teachers, that students did not have very good English levels, so as a result could not be engaged in conversation in this way.

The following graphs show the extent to which the different modes were used in each lesson, based on the number of words uttered in each mode.

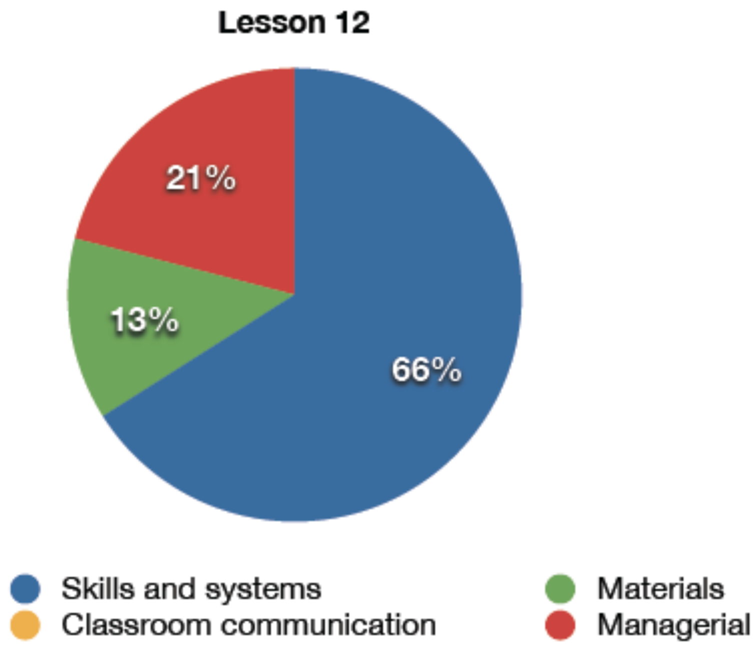
Figure 5.1: SETT breakdown of Lessons 1 and 2 (CLIL lessons taught mostly in English)

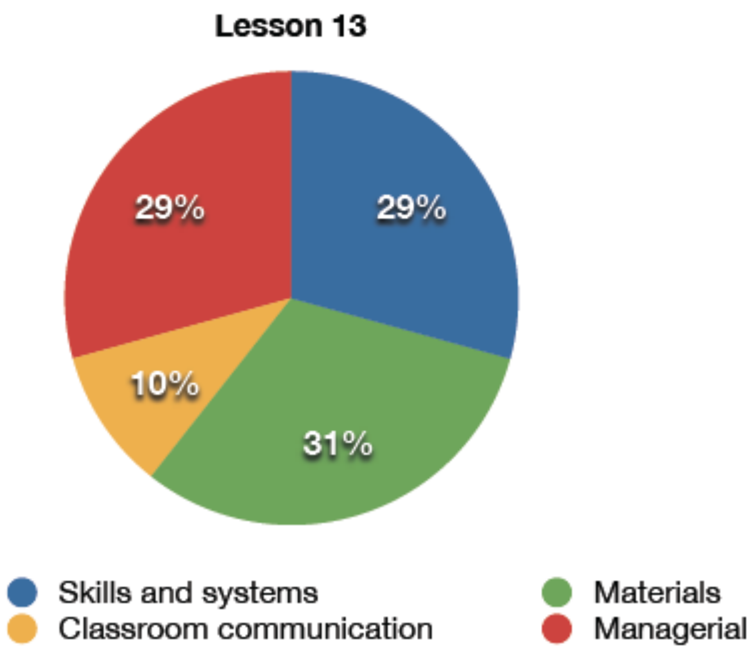




In these two CLIL lessons, managerial is by far the most prevalent mode with skills and systems and materials mode used to a lesser degree. A reason for this high level of managerial mode could be due to Maria wanting to give clear instructions for tasks, using repetition in English and Catalan to ensure students understood what they had to do. Furthermore, this high level of managerial mode reflects the frequent recaps of content, where Maria switched out of materials or skills and systems mode to summarise the points being made.

Figure 5.2: SETT breakdown of Lessons 12 and 13 (Lessons taught in students' L1)





In the L1 lessons, we can see that managerial mode plays a much smaller part, and the classroom talk is dominated by skills and systems and materials mode. This reduction in managerial mode perhaps shows that Maria did not feel the need to give such detailed instructions, or to provide regular summaries of the discussion, assuming that students would be able to follow the Catalan discourse without any problems.

The SETT analysis of Maria's lesson transcripts points to a more varied and fluid series of interactions in Maria's L1 lessons, with more scope and space for learner involvement.

The relatively high incidence of managerial mode in the CLIL lessons demonstrates a commitment to checking student comprehension, while the extensive use of materials mode in the CLIL lessons, shows that the teacher believed that visual support would aid explanations in English. This analysis also indicates a markedly different structure between the L1 and the CLIL lessons, with the L1 lessons comprising a more varied pattern that involved higher student participation, and less reliance on materials for explanations. The CLIL lessons, in contrast, show that the teacher recognised the importance of concept checking instructions, and using materials and equipment to help present and elicit information.

5.2 The IRFEx Framework

While the SETT analysis is useful in providing a broad overview of the interaction and discourse in the lessons in this study, I wanted to be able to analyse the transcripts in greater detail. To do this, as I have already explained in chapter 3, I developed my own coding system using the IRF (Initiation, Response, Feedback) framework (Sinclair and Coulthard,1975; Lemke, 1990) as a starting point. These codes were chosen on the basis of the types of utterance that appeared in the lesson transcripts. In addition to the Initiation, Response and Feedback moves, I added a further Extension (Ex) move to the coding system to indicate when follow-up questions were asked. In this section, I present the results of this IRFEx framework analysis from Maria's CLIL and L1 lessons.

5.2.1 Levels of challenge and the role of questions

In her interview, Maria described how she thought she had lower expectations of students in the CLIL lessons, and did not make such high demands on them. By looking at the types of questions she asked in the CLIL and L1 learning environments we can see whether this in fact is the case.

Typology of questions and expectations of students

The questions a teacher asks provide insight into their expectations of students' knowledge and, in the case of the CLIL lessons, their language skills. In addition, they reveal what the teachers' goals are at that point in a lesson, for example whether they want to check comprehension or encourage communication. A full list of the categories for coding verbal contributions with examples are presented in table 3.10 in chapter 3.

Table 5.2 shows the questions Maria asks in both the L1 and CLIL lessons according to whether they ask students about vocabulary, science facts, science explanations, or for a description, and also if she is reformulating a question or asking for some other type of information (other elicit).

Table 5.2: Questions asked by Maria in her CLIL and L1 lessons

	Maria's CLIL	As a % of total	Maria's L1	As a % of total
Vocabulary question	15	25%	16	9%
Science fact (open and closed)	31	51%	76	45%
Science explanation (open and closed)	3	5%	20	12%
Description	8	13%	33	19%
Reformulation or clue	4	7%	1	0.60%
Other elicit	0	0	24	14%
Total	61		170	

Perhaps unsurprisingly, Maria asks significantly fewer vocabulary questions in the L1 lessons, though she does still check student understanding of scientific vocabulary such as 'impermeable' and 'emulsion'. More scientific facts are elicited in the CLIL lessons than in the L1 environment, while the reverse is true for scientific explanations. This could reflect Maria's belief that while students in the CLIL lessons could grasp and answer questions on facts, they would not have as much scientific knowledge or linguistic capability to answer questions asking for explanations.

More surprisingly, as they demand neither high linguistic or scientific knowledge, Maria asks for fewer descriptions in the CLIL lessons. This could have been a missed opportunity to garner more student talk, as students in the CLIL lessons would undoubtedly have been able to tell the teacher what colour they could see in a test tube. The emphasis on collecting correct scientific facts without engaging in more informal communication with students, is also described earlier, in the section on the SETT Framework, which shows less time was spent in classroom communication mode (encouraging students to express themselves) in the CLIL lessons, with a greater emphasis on the modes that transmit and elicit information.

Maria asks more reformulated questions in the CLIL environment than in her L1 lessons to give students clues when they do not understand a question the first time it is asked, and to rephrase it in different language (sometimes in L1). For example, in lesson 2, she draws a diagram on the board to help students answer whether a cork in a beaker of water sinks or floats.

Extract 5.12. Lesson 3 (Maria)

Line	Speaker	Transcript	IRFeX event
18	T	what is it sinks?	Ex1E Extension vocab question
19	S	flotar //floats//	R1C short response in Catalan
20	T	no.. it floats? ((draws a picture on board to illustrate floats and sinks)).. sinks?	F2E rejects answer Ex8E reformulates question

This reformulation technique tends to be used when Maria can see that students are not following her (either because they look confused or have not been able to answer a question) and she needs to find a new way to ask a question.

Open vs closed questions

Musumeci (1996) views open questions as central to determining the length and complexity of student responses. Moreover, Walsh (2006) points out that while teachers can use closed questions effectively to check comprehension, if their agenda is to promote class discussion then more open, referential questions are needed. A high proportion of open questions asked in class would therefore point to teachers seeking longer and more in-depth responses from students. Given Maria's assertion in her interview that she had lower expectations of students in the CLIL lessons than in the L1 lessons, we might expect to see fewer open questions in the CLIL environment. In fact, Maria asks a slightly greater proportion of open questions in her CLIL lessons (71%) than in her L1 lessons (65%) (see table 5.3)

Table 5.3: Open and closed questions asked in Maria's CLIL and L1 lessons

	Maria's CLIL lessons			**Maria's L1 lessons**
	All	Asked in English	Asked in Catalan	
Open	30 (71%)	24 (57%)	6 (14%)	74 (65%)
Closed	12 (29%)	11 (26%)	1 (2%)	39 (35%)
Total	42			113

This use of open questions by Maria in the CLIL lessons shows a commitment to maintaining a high level of challenge in lessons and a resistance to making it too easy. One way she overcomes the problem of students being unable to answer the open questions she poses in English is by repeating them in Catalan so everyone can understand, and whether this is intended or not, giving students the impression that a response in Catalan would be acceptable, since if the teacher is able to use L1 in the CLIL environment, then why not the students too (see extract 5.13 below)?

Extract 5.13. Lesson 6 (Maria)

Line no.	Speaker	Transcript	IRFEx event
57	T	at the beginning of fall what happens.. the water is.. how is the water at the beginning of fall? //how is the water at the beginning of fall//	Ex2E Extension question open science fact Ex2C Repeats question in Catalan
58	S	hot	R1E short answer in English

Line no.	Speaker	Transcript	IRFEx event
59	T	//hot because xx// ((explains in Catalan)) and what happens? little by little the warm water //what does it do?//	F1C accepts answer in Catalan F3C additional explanation in Catalan Ex2E Extension question open science fact Ex2C Repeats in Catalan
60	S	//xxxxx// ((answers in catalan))	R1C Short answer in Catalan

Whether Maria asks an open or closed question depends on the type of question she is asking (see table 5.4). Open questions are used in all of the examples of her eliciting an explanation, with many of these questions involving the question word ‘why’, for example, ‘you think it’s a pure substance, why?’ (Lesson 9). Descriptions are mostly elicited as open questions as well, with Maria asking students what they can see during experiments, for example, ’try to sink it... what happens?’ (Lesson 2). Both these types of question are also intending to encourage discussion.

Maria still uses open questions most of the time when eliciting facts, for example, ‘what is evaporating first?’ (Lesson 3), but questions for facts, which by their nature are all display questions, tend to be used by teachers to check comprehension. While asking open questions in these cases is still a more effective way of knowing if students have understood the content (without the 50:50 chance of being correct), a closed question can still achieve this pedagogical goal.

Table 5.4: Open and closed questions asked by Maria by question type

	Maria's CLIL lessons			**% of open questions for each category**	**Maria's L1 lessons**	**% of open questions**
	All	In English	In Catalan			
Science fact open	21	16	5	68%	33	67%
Science fact closed	10	9	1		29	
Science explanation open	3	3	0	100%	20	100%
Science explanation closed	0	0	0		0	
Description open	6	5	1	75%	15	60%
Description closed	2	2	0		10	
Other open	0	0	0		5	100%
Other closed	0	0	0		0	
Total				71%		65%

Display vs referential questions

The questions that appear in the transcripts can be divided into display questions, which the teacher already knows the answer to e.g. 'what is a mixed layer?' and referential questions, which a teacher asks because he or she doesn't know the answer and wants to encourage communication e.g. 'what does this remind you of?'.

Studies in the eighties (Long and Sato, 1983; Brock, 1986; Nunan, 1987) argued that referential questions were more likely to produce 'natural' and more communicative responses than display questions. Later studies (Banbrook and Skehan, 1990; Seedhouse, 1996) question this traditional distinction and suggest that display and referential questions are functionally different, but referential questions can also elicit short answers, and display questions more in-depth ones depending on what is asked. For example, why-questions, which are display questions, can encourage a long communicative response, whereas a closed referential question will only elicit a 'yes' or 'no' from learners. While a useful way of distinguishing between question types, Nunn (1999) regards the extent to which a question achieves its pedagogic goal as more important than whether it elicits a communicative response.

I have calculated the proportion of display questions asked by adding together all of the questions for facts and explanations (including reformulations), while the referential questions are those where Maria asks students to describe something, or elicits something else, for example to point out what instruments there are in the laboratory that can make water evaporate.

According to Walsh (2006), while the display/referential distinction is useful, the extent to which a question serves its purpose at a particular moment in a classroom exchange is more important than whether a question produces a communicative response.

Table 5.5: Display v referential questions in Maria's lessons

	Maria's CLIL lessons	**Maria's L1 lessons**
Display questions	37 (82%)	83 (69%)
Referential questions	8 (18%)	37 (31%)

As table 5.5 shows, referential questions are asked much more frequently in the L1 lessons. This could point to two things: Maria's aims for the CLIL lessons being more about presenting and checking scientific facts than encouraging communication, particularly when learning outcomes may be compromised by the limited language abilities of students. Secondly, it could point to a more chatty and informal teaching style in the L1 lessons, as illustrated in extract 5.14 below. This latter point has been described earlier in the section on the SETT framework, which sees classroom communication mode featuring more in the L1 environment.

Extract 5.14. Lesson 13 (Maria)

Line no.	Speaker	Catalan transcript	English translation	IRFEx event
57	T	...es roques calcàries....sabeu el marbre de la cuina? perquè abans el marbres eren de color blanc. algú té a casa de l'àvia o casa seva...	...limestone marble, you know the marble in the kitchen. because before, the marble was white. does anyone have it at home or in their grandmother´s home...	I0C Open question (other type of elicit)
58	S1	jo	I do	R1C short response
59	S2	jo, jo el tinc blanc	me me.. I have a white one	R2C long response

Maria's use of referential questions in the L1 lessons seemed to result in a higher than usual number of learner responses. For example in lesson 13, she asked students what food the colour in a beaker reminds them of, which encourages different students to suggest banana, lemon sorbet and various types of soup. This type of referential question, which does not need any scientific knowledge to answer, was successful in involving a wide number of students, who may not have felt inclined to answer the more demanding display questions, which require a correct answer. In this example the referential question elicits responses from several students, although answers still mostly comprise just one or two words.

Extract 5.15. Lesson 13 (Maria)

Line	Speaker	Catalan transcript	English translation
123	T	Aviam, aquest color a quin aliment us recorda?	Let 's see.. what food does this color remind you of?
	SS	((Ss parlen a la vegada, fan diferents comentaris i la T es posa a riure))	((Ss speak at once, and make various comments T laughs))
124	S1	a plàtan	banana
125	S2	a sorbet de llimona	lemon sorbet
126	T	ah, també, si.. aviam, però si fos molt més sòlid...	as well, yes.. let's see.. but if it were much more solid
		((Ss fan comentaris de manera simultània))	((Ss simultaneously make comments))
127	S1	a sopa	of soup
128	S2	a plàtan	of banana
129	S3	a caldo	of broth

Why-questions

According to Wintergest (1993), why-questions promote longer responses from students (42% of why-questions in her study elicited longer answers), and their frequency increases with both the age and level of the students. Maria asks far more why-questions in the L1 lessons than in the CLIL lessons. The why-questions asked in this next extract have little success in encouraging a communicative response from students, and Maria asks a follow up questions to get the answer she is looking for.

Extract 5.16. Lesson 12 (Maria)

Line	Speaker	Catalan transcript	English translation
20	T	si, es tornen en partícules molt petitones que queden barrejades amb l'aigua, val? I per què diem que la mescla entre l'aigua i el sucre és una mescla homogènia? Per què ho diem?	yes.. it becomes very tiny particles that are mixed with water okay? and why do we say that the mixture between water and sugar is a homogenous mixture? why do we say that?
21	SS	perquè no es veu	because you can't see it
22	T	perquè no es veu, què?	because you can't see what?
23	S1	els components del sucre	the components of the sugar
24	S2	a ull nu	to the naked eye

A few lines later in the same lesson, Maria asks another why-question, but this time she answers it herself without giving students space to respond.

Extract 5.17. Lesson 13 (Maria)

Line	Speaker	Catalan transcript	English translation

27	T	molt bé, molt bé. No es distingeixen a ull nu ni amb el microscopi les substàncies que el formen, val? Aixó és l'apartat B: per què diem que la mescla entre l'aigua i el sucre és una mescla homogènia? Perquè no podem distingir les substàcies que el formen a ull nu.	very good very good.. the substances that it's made of are not visible to the naked eye or with a microscope okay? this is section B.. why do we say that the mixture between water and sugar is a homogenous mixture? because we cannot distinguish the substances it is made of with the naked eye

5.2.2 Dialogic teaching and the co-construction of meaning

In Chapter 2, we saw that dialogic teaching (e.g. Wells, 1999; Alexander, 2008) is becoming a favoured strategy among teachers who want to involve their students more in the learning process. In Maria's interview, when I asked her to describe her educational approach, she cited dialogic teaching as something she aims to do in both her L1 and CLIL lessons. This approach is reflected in the questions she asks and the way she tries to use students' contributions to construct meaning.

It is these contributions made by students, rather than the questions asked by teachers, that reveal whether lessons are more truly monologic or dialogic. These two types of utterance are, of course, highly dependent on each other; students respond to teacher questions, and these responses determine the next question a teacher asks, and whether further explanation needs to be given.

The extent to which Maria's CLIL and L1 lessons are dialogic or monologic is illustrated by the way teachers and students shared IRFEx moves in class (see table 5.6). Traditionally in an IRFEx sequence, we would expect to see teachers using the I-move to ask questions, students responding in the R-move, teachers providing feedback in the F-move and then asking additional questions in the Ex-move. This pattern can be seen in the CLIL lessons where, most of the time, Maria and her students stayed within their traditional areas, pointing to a more monologic lesson type. In the L1 lessons, however, there is much more fluidity of movement. As table 5.6 shows, students make 48% of I-moves and 8% of Ex-moves which shows their involvement in asking questions. Maria made 16% of

R-moves which shows a reversal of roles, where she answered their questions. A more dialogic classroom dynamic, therefore, is evident in the L1 lessons.

Table 5.6 Breakdown of IRFEx-moves

	Maria's CLIL lessons	**Made by teacher as a %**	**Made by students as a %**	**Maria's L1 lessons**	**Made by teacher as a %**	**Made by students as a %**
I-move	26 (14%*)	92	8	67 (11%)	52	48
R-move	56 (29%)	5	95	250 (40%)	16	84
F-move	71 (37%)	100	0	202 (32%)	100	0
Ex-move	37 (19%)	100	0	110 (17%)	92	8

* % show percentage of each move in a lesson type e.g. 14% of all moves in Maria's CLIL lessons were I-moves

Student questions

The way students initiate discussion and shape the course of the L1 lessons points to a much greater level of confidence in their own language when it comes to expressing ideas and making demands on the teacher. The types of questions students asked in the L1 lessons are mostly on topic and request clarification of a point, for example, when a student in lesson 12 asks if solids can make emulsions, giving Maria the opportunity to clarify that emulsions are always between two liquids, but can take on the appearance of solids when they become permanent. Students also use questions in the L1 lessons to challenge Maria when they disagree with a point she has made. In the extract below, a student called Nuria is fairly certain that mashed potato is an emulsion and argues her point with Maria for a few lines.

Extract 5.18. Lesson 12 (Maria)

Line no.	Speaker	Catalan transcript	English translation	IRFEx event

Line no.	Speaker	Catalan transcript	English translation	IRFEx event
47	S (Nuria)	però no és una emulsió?	but isn't it an emulsion?	ExS4C - student extension question
48	T	però, no es pot dir que sigui una emulsió, és una barreja simplement, núria. és una barreja entre un sòlid i un líquid.	but it can't be called an emulsion.. it's a simple mixture Nuria.. it's a mixture between a solid and a liquid.	RT5C - teacher response
49	S (Nuria)	però quan fas puré de patata, que tens la patata trinxada i, llavors, poses la llet, la llet queda cap a dalt i llavors l'has de barrejar.	but when you make potato purée ((mashed potato)) you have the mashed potato and then you add the milk.. the milk remains at the top and then you have to mix.	ExS4C - student extension question
50	T	clar, exacte	of course.. exactly	RT5C - teacher response

Incidences of students standing their ground in this way do not appear in the CLIL lessons where students seem to accept what they are told. It may be that they disagree with what Maria is saying, but they do not have the linguistic skills to challenge her. It is likely that with their A1-B1 levels of English, even if a student did think of a point they wanted to make, by the time they had worked out how to express it in English the moment would have passed and the group would already have moved on to a new topic or activity.

Maria obviously prefers a dialogic learning environment as it shows that students are listening and understanding the content, and in her interview she sees the lack of student questions in the CLIL environment as something negative and in need of addressing, for example, with specific tasks to give students time to formulate questions. However, at times, students' questions in the L1 lessons, far from helping with an explanation, hold up proceedings and derail the lesson for a few minutes. In lesson 12, for example, one student wants to know first of all if light is a gas, then if it has atoms and finally if it has anything to do with electrons. At this point Maria tells the group that it is too complicated to go into at 2nd of ESO and they will learn about it later.

Perhaps, though, a truly dialogic style of teaching would not suit the CLIL lessons given the low English levels of students. While a three or four-minute break during which time a student goes off topic causes little confusion in an L1 lesson, in a CLIL classroom where the students are already struggling to understand, the whole process would probably take much longer to resolve and may cause some students to note down incorrect information.

Maria and Belén make the point in their interview that all of the students who had studied the Heat unit in English answered a question correctly in the end of course exam about metal expanding when it heated. The mostly likely reason for this is the scaffolded nature of the lesson where this information was taught. Students first learned the vocabulary related to the lesson with a picture/word matching task, they then did a practical activity with a metal ball that went through a hole when it was cold, but was too big to fit through after it was heated. Finally, they drew pictures to show what had happened in the experiment and to illustrate the speed that the particles were moving in the cold and hot balls.

What frequently happens in the L1 lessons is one or two students dominate by answering all the questions or asking their own. While it seems to the teacher that they were leading a dynamic and dialogic lesson full of involved and interested students, it may be that only a handful of students were paying active attention and the rest of the group were lost. In the fast paced, un-scaffolded L1 environment it is likely that some fundamental facts fly over some students' heads. In the CLIL classes, the chances of students being left behind is reduced as the same concepts are taught repeatedly and in different ways, as demonstrated by the success of all the students in the Heat unit exam, which Maria and Belén talk about in their interviews.

Thus, although the concepts may not be as sophisticated as those taught in the L1 environment, they have a better chance of sticking in the minds of students. Perhaps then, while the dialogic format of the L1 lessons may suit the high flyers and more participative students, the slower more-repetitive nature of CLIL lessons may be more effective in getting the message across to the whole group.

Student R-moves

The R-move is the main stage where students get the chance to contribute to learning. However, this move is significantly less common in the CLIL lessons (29% as opposed to 40% in the L1). A reason for the low percentage of R-moves in the CLIL lessons is the number of other moves needed to get students to answer questions. Maria often asks a question a couple of times first asking an open question, then switching to a closed question and often repeating it in Catalan (see extract 5.13 above). She then might follow up a short student answer with an explanation, as extract 5.19 illustrates.

Extract 5.19. Lesson 2 (Maria)

Line no.	Speaker	Transcript	IRFEX event
49		do you know what impermeable means?	Ex1E vocab extension question
50	S	//impermeable//	RIC short answer in Catalan
51	T	the cork is impermeable.	F1E accepts answer
		the water can't go inside.. ((repeats in Catalan)).. do you understand? why do they put it in the bottle? ((repeats in Catalan)).. it has no holes ((repeats in Catalan)).. no holes so the water cannot go in.. you do the drawing and you write.. no holes.	F3E additional explanation

In the L1 lessons, on the other hand, Maria can often elicit a student response from just one question, and this response can be sufficiently full for Maria not to add to it and feel like she can move on to a new question, without stopping to give further explanation.

Extract 5.20: Lesson 10 (Maria)

Line	Speaker	Catalan transcript	English translation	IRFEx event
4	T	aleshores, quan nosaltres diem...per exemple, si diem una substància pura, jo si dic substància pura, ara no ho apuntarem ja ho apuntarem a classe, però diem...si jo et dic això és una substància pura, vosaltres que dirieu què vol dir? digues eli.	so when we say.. for example.. a pure substance.. if i say pure substance rather than pointing to it in class.. but we say this is a pure substance.. what would you say that it means? yes Natalia?	I2C open question (science fact) (Initiates new topic)
5	S	que no està barrejada amb res.	that it's not mixed with anything	R2C long response
6	T	molt bé, eli, que no està barrejada amb res.	very good Natalia.. that it's not mixed with anything	F1C accepts answer
		algú diria una altra cosa d’una substància pura?	could you say anything else about a pure substance?	Ex2C open question (science fact) (extension of same topic)
7	S	que està neta	that it's clean	R1C short response
8	T	què està neta? molt bé.	that it's clean very good	F1C accepts answer

Short answers are far more prevalent in the CLIL lessons. As table 5.7 indicates, short answers comprise 86% of responses in the CLIL lessons, whereas in the L1 lessons they make up 62.5%. This is due partly to students' linguistic limitations. For example, when asked to identify an object being held up in lesson 2, a student answers simply 'pumice' rather than 'it's pumice' or 'it's a pumice stone'.

Table 5.7: Short and long responses in Maria's lessons

	CLIL lessons	**As % of total**	**L1 lessons**	**As % of total**
Total short responses	160	86%	105	62.50%
Total long responses	27	14%	63	37.50%
	187		168	

Another factor is the way questions are asked in the CLIL lessons. Although the number of closed questions asked is quite low, a lot of the questions only really require one or two words, for example, ‘What's that?’, ‘What does x mean?’ However, this cannot be held completely responsible for the predominance of short responses, as similar questions tend to elicit a longer response in the L1 environment as extracts 5.21 and 5.22 demonstrate. That said, the shorter response in the CLIL lesson works just as well as the longer one in the L1 environment. In fact, a short answer gives the rest of the groups fewer words to have to process and understand and may aid comprehension.

Extract 5.21. Lesson 2 (Maria)

Line no.	Speaker	Dialogue	IRFEX event
62	T	what happens with the sponge?	Ex6E Extension question asking students to describe something
63	S	Floats	R1E short answer in English

Extract 5.22. Lesson 12 (Maria)

Line no.	Speaker	Catalan transcript	English translation	IRFEx event
28	T	què va passar quan vam barrejar?	what happened when we mixed them?	Ex6C Open extension question asking students to describe something
29	S	que van quedar bombolletes	they turned into bubbles	R2C Long response

In addition to providing mostly short responses, students are also twice as likely to switch to L1 when they have more to say during a CLIL lesson as table 5.8 illustrates.

Table 5.8: Length of responses in Maria's lessons

	Maria's CLIL lessons	**In English**	**In Catalan**	**Maria's L1 lessons**
Short response	46 (88%)	26 (50%)	20 (38%)	114 (63%)
Long response	6 (12%)	2 (4%)	4 (8%)	66 (37%)
	52		24	

Students' unsolicited comments and observations in the R-move

While not questions or comments that initiate discussion, students also make several extra comments that are not strictly speaking responses in the R-move, which shows a more dialogic dynamic at work in the L1 environment. These vary from '*quina olor*' 'what a smell!' in response to an experiment with a distillation in lesson 3, to interruptions such as the one in this extract from lesson 10 to show understanding and summarise proceedings.

Extract 5.23. Lesson 10 (Maria)

Line no.	Speaker	Catalan transcript	English translation	IRFEx event
43	S	components	components	R1C short response
44	T	components, molt bé. aviam, la llet és així, però tu la pots separar. oi que tu pots separar el greix de la llet, l'aigua de la llet, el sucre de la llet...ho pots separar.	components very good.. so milk is like this but it can be separated you can separate the fat from the milk the water from the milk the sugar from the milk .. you can separate it	F1C accepts answer F3C additional explanation
45	S	però, llavors tot es pot separar	but then everything can be separated	R6C Unsolicited observation
46	T	no, perquè tu, per exemple, la substància...	no because for example the substances...	F5C Responds to student comment
47	S	però de l'aigua tu pots separar la...	but water can be separated	R6C Unsolicited observation

In total, students make 21 comments like this in the L1 lessons, 8.4% of all the R-moves made (including those by the teacher). No comments like this appear in the CLIL lessons where students' R-moves are always responses to questions and prompts by the teacher. The lack of such comments in the CLIL lessons, made her doubt whether students were listening to or following the lesson. However, as argued above, the value of these comments may only be superficial. For example, in extract 5.23 above the students' unsolicited comments interrupt Maria mid-flow, and may have left students unclear on whether all substances can be separated or not.

One value of students commenting in this way in the L1 lessons is that it breaks up the dialogue so they are not just listening to Maria giving explanation after explanation.

However, the rhythm of the CLIL lessons is broken up in a different way: with a greater variety of tasks.

Teacher made R-moves

While responses (R-moves) are mostly the realm of students, in the L1 lessons Maria contributes 40 responses or 16% of all R-moves made, when she responds to students' questions and observations (see table 5.6). In the CLIL lessons she only makes 3 (5% of the total).

As we saw in extract 5.18, Maria ended up in responding to Nuria's questions about mashed potato during a plenary-style stage of the lesson. This provided Maria with the opportunity to reiterate her explanation of what a simple mixture is. This role-reversal which is much more prevalent in the L1 lessons that in the CLIL classes points to a more dialogic form of teaching, and the sharing of responsibility for knowledge construction with students.

5.2.3 Depth and complexity of content and the Ex-move

As described in chapter 3, the Ex-move is used by teachers to expand on a theme by asking follow-up questions. Table 5.9 shows the breakdown of questions asked by type in the CLIL and L1 lessons and between I-moves and Ex-moves. Maria was more likely to ask vocabulary questions in an I-move, using this question type as a way to kick off a new discussion. All the other question types were favoured in the Ex-move. In particular closed questions eliciting science facts were asked more in the CLIL lessons during the Ex-move, and open questions seeking facts were only asked in the Ex-move in the L1 lessons. These questions, which often began with the word 'why', seek to provide additional understanding and depth and show a scaffolded approach by the teacher who asks easier questions first and then, once the answers to these are established, seeks more in-depth knowledge from students.

Table 5.9: Open and closed questions in Maria's lessons

Open and closed questions asked by question type (I-move only)	Maria's L1 lessons			Maria's CLIL lessons		
	I-move	Ex-move	% Ex-move	I-move	Ex-move	% Ex-moves
Vocabulary	6	4	40%	13	2	13.5%
Science fact open	5	28	85%	7	14	67%
Science fact closed	9	20	69%	1	9	90%
Science explanation open	0	20	100%	1	2	67%
Science explanation closed	0	0		0	0	
Description open	6	9	60%	2	4	67%
Description closed	2	8	80%	0	2	100%
Other open	0	5	100%	0	0	
Other closed	0	0		0	0	

Ex-moves are distinct from I-moves in that they continue a theme already initiated in the I-move. Maria's view that the CLIL lessons were less in-depth in their content would point to there being fewer Ex-moves in the CLIL lessons. A possible pattern could have emerged of the I-move being used to ask a question, students answering the question (F-move), receiving feedback (F-move) and then being asked a new question on a different theme using another I-move. A typical sequence could therefore look like this: I R F I R F I R F, etc.

However, the number of Ex-moves is roughly the same in both lesson types, making up 17% in the L1 and 19% in the CLIL lessons. What seems to occur in both lessons is that most questions that are asked are in fact extension questions leading on from an initiation (either by the teacher or a student), so a typical sequence looks more like this: I R F Ex R F Ex R F, etc. (see extract 5.12 from lesson 3 and extract 5.20 from lesson 10). The high proportion of Ex-moves in both the L1 and CLIL lessons therefore indicates that the teacher is asking multiple questions on the same topic to broaden the depth of understanding and check students' knowledge.

5.2.4 Weaving a coherent web with the F-move

Christiane Dalton-Puffer describes how teachers in her study of CLIL in Austrian secondary schools use the F-move to 'weave a coherent topical and conceptual web, which is compatible with the requirements of the subject' (Dalton-Puffer, 2007: 79).

This type of complementary dialogue between teacher and students is evident in Maria's L1 lessons. In extract 5.20 from lesson 10 above, we saw how students' R-moves are used by Maria to construct a logical story, where she brings together various student ideas to create a picture of what a pure substance is. In the CLIL environment, however, the students' contributions are much shorter and Maria does not so much weave a web out of students contributions, as create her own story to tell students. Rather than do this with a monologic style of teaching as one might expect, she creates a patchwork of activities; experiments, group feedback, gaps fills, etc. and through these tasks creates a scaffolded learning experience for learners which compensates for the lack of student input.

A key difference between the students in my study and those in Dalton-Puffer's are the levels of English among students. Most of the students in Maria's groups had an A1 or A2 level, typical of Spanish and Catalan secondary school pupils. In contrast, Dalton-Puffer's Austrian students seem to mostly have at least a B1 level which enables them to both follow the content of the lessons and make relevant contributions.

Extract 4.18 Biology, grade 6

R	1	S	brain
F/I	2	T	astra, did you listen to my question. I want organs that work together
R	3	S	but the brain has connections with the organs
F/I	4	T	yeah so what does it do?
R	5	S	they work together

From Dalton-Puffer Discourse in Content Language Integrated Learning (CLIL) classrooms (2007: 89)

The only examples of students in my study expressing themselves with this level of fluency appear in the L1 lessons. Therefore, the CLIL lessons could not have the dialogic nature of their L1 counterparts using a similar format, instead the structure and pace of the lessons had to be adapted to suit the language levels of students in the classroom.

Typical feedback patterns

Teacher feedback generally consists of an evaluation of students' answers followed by an additional explanation or summary of ideas, and a new question in the IRF stage. This pattern was common in both the CLIL and L1 lessons, although a greater proportion of additional explanations occur in the CLIL lessons (see table 5.9). For example, in extract 5.24 from lesson 2, Maria uses the feedback move to confirm correct answers, summarise points and lead students on to the next question.

Extract 5.24. Lesson 2 (Maria)

Line	Speaker	Transcript	IRFEX event
49	T	ah *si* //yes// very good very good	FIE accepts answer
		do you know what impermeable mean?	Ex1E vocab extension question
50	S	//impermeable//	RIC short answer in Catalan
51	T	the cork is impermeable.	F1E accepts answer

		the water can't go inside. ((repeats in catalan)).. do you understand? why do they put it in the bottle? ((repeats in Catalan)).. it has no holes ((repeats in Catalan)).. no holes so the water cannot go in.. you do the drawing and you write.. no holes	F3E additional explanation
		and is it light or is it heavy?	Ex3E Extension question - closed science fact

This pattern is repeated in this example from lesson 10 when Maria elicits the components that make up cow's milk.

Extract 5.25. Lesson 10 (Maria)

Line	Speaker	Catalan transcript	English translation	IRFEx event
32	T	què més té? molt important...molta quantitat de...?	what else does it have?.. very important.. a lot of?	Ex2C Extension question open science fact
33	S	proteïna	protein	R1C short response
34	T	també.	as well	F1C accepts answer
35	S	aigua	water	RIC short response

36	T	aigua.	water	F1C accepts answer
		té aigua, té proteïnes, té glúcids, té lípids o greixos, té sucres, té calci. això és una barreja, si o no?	it has water it has proteins it has carbohydrates it has lipids or fats it has sugars it has calcium so is it a mixture yes or no?	F3C provides additional explanation.

Evaluating student responses

More answers were rejected in the L1 lessons than in the CLIL classes (see table 5.10). This could be due to the teacher not wanting to discourage student contributions in the CLIL lessons, or maybe because the questions were easier to answer and students made fewer mistakes. Another explanation could be that students were less afraid of making mistakes in the L1 environment and were more willing to hazard a guess.

Table 5.10: Teacher feedback

	Maria's CLIL lessons			**Maria's L1 lessons**
	All	English	Catalan	
Accepts answer	40 (93%)	26 (60%)	14 (32.5%)	99 (87.5%)
Rejects answer	3 (7%)	1 (2%)	2 (4.5)	14 (12.5%)
Total answers	43	27	16	113
Additional explanation	25	17	8	52
Additional explanation as a percentage of all IRFEx moves	13%			8%

In this example from an L1 lesson on distillation, it seems that students are shouting out answers because they want to be involved as much as to provide a correct response.

Students watch a beaker of wine being heated and see the alcohol being distilled while the teacher asks questions about what they are observing.

Extract 5.26. Lesson 3 (Maria)

Line	Speaker	Catalan transcript	English translation
9	T	s’esta evaporant tot a l’hora?	is it evaporating all at the same time?
10	SS	no	no
11	T	no, s’esta evaporant primer que?	no.. what is evaporating first?
12	Ss	lo d’abaix	the bottom
13	T	no. la d’abaix s’escalfa primer, pero que es lo que s’esta evaporant?	no.. the bottom is heated first.. but what is evaporating first?
14	Ss	lo de dalt	the top
15	T	si exacte..pero quin?	yes exactly.. but what?
16	S	el vi	the wine

5.2.5 The F-move: repair

Maria employed a variety of strategies to deal with repair. In the CLIL lessons, repair was mostly related to language issues. For example, when Maria elicited the meaning of key vocabulary such as 'sink', 'explanation' and 'raw', she responded to students' incorrect answers with direct correction, rather than eliciting self or peer-correction.

Extract 5.27. Lesson 2 (Maria)

Line	Speaker	Transcript
6	T	so what do you have to do? you have to do an experiment which is going to tell you and here in this four parts you have to do a drawing of what happens in every stage.. and here where it says explanation? what is this an explanation?
7	S	*aplicar*? //apply//
8	T	*explicació*. //explanation//.. you have to explain what happens.. ok so go to the beginning of the xxx.. so we have the material that we need.. the first thing to the left.. what's that?

In the same lesson, however, she encourages self-correction when a pupil tells her that sinks means *flotar* (to float). In this case (see extract 5.12) she draws a picture on the board to illustrate floating and sinking. She also tries to elicit the meaning of 'raw egg' from students in lesson 2, but after hearing a number of wrong suggestions, gives up and tells them the answer in Catalan.

Extract 5.28. Lesson 2 (Maria)

Line	Speaker	Transcript
79	T	now a raw egg.. what is a raw egg?
80	SS	((various wrong ideas in Catalan)
81	T	((laughs).. no *crud* //raw//.. ok.. a raw egg and then...

In the L1 lessons, repair related more to scientific concepts. In this example from lesson 13, Maria tried to elicit self-correction by echoing the student's incorrect response with some questioning intonation to indicate an error had been made.

Extract 5.29. Lesson 13 (Maria)

Line	Speaker	Catalan transcript	English translation
12	T	la pregunta 1 diu: tu saps que la sal i el sucre són solubles en aigua. Què vol dir aixó? Vol dir que quan posem sal o sucre en aigua, què passa?	question 1 says.. you know that salt and sugar are soluble in water.. what does this mean? it means that when you put salt or sugar in water.. what happens?
13	S	que es barreja	that it is mixed
14	T	que es barregen?	that it mixes?
15	S	que es desfà	that it dissolves
16	T	que es desfà, molt bé Andrea. La sal i el sucre es desfà i es barreja amb l'aigua, val?	that it dissolves very good Andrea.. the salt and the sugar dissolve and are mixed with the water ok?

Maria mostly tries to use indirect repair strategies, regardless of whether she is in an L1 or CLIL environment or whether the error relates to science or language. What seems to happen, however, is that while she can successfully encourage self-correction in her L1 classes by using questions, in the CLIL lessons, she often has to resort to telling students the correct answer.

5.2.6 Prevalence of IRFEx in L1 classrooms

IRFEx moves were considerably more prevalent in Maria's L1 lessons, which contained an average of 157 IRFEx moves, while the L1 lessons had a much smaller proportion, with only 63 moves per lesson. This highlights the difference in format of the two class types. In the L1 lessons, even when students were engaged in practical activities, Maria relied more on teacher talk and IRFEx sequences to teach. On the other hand, she used a greater variety of tasks in her CLIL lessons, and the IRFEx sequences were mostly used to give instructions for tasks and and to round them up. In one CLIL lesson (lesson 2), Maria begins by giving instructions for an experiment where students place different objects in water to see which ones float. Students spend 10-15 minutes on the task, and then a short IRFEx feedback session takes place followed by students drawing pictures of what they observed on worksheets. Next, Maria gives instructions for a final activity that involves students putting salt in a beaker of water and seeing which objects float in the water. In contrast, in lesson 13 (taught in students' L1) the entire lesson is conducted using IRFEx events. Maria uses materials and experiments to engage her learners, but there are no breaks to participate in activities or complete worksheets. What we see then, is while the IRFEx sequences in the CLIL lessons contain far less student involvement, this does not mean that the lessons themselves are monologic. Instead, Maria uses other activities and tasks to involve students in the learning process.

5.3 Control of patterns of communication

According to Breen (1998, as cited in Walsh, 2006), teachers orchestrate interaction in the classroom by controlling topics of conversation and managing turn-taking, and in this way they 'facilitate or hinder learning opportunities' (Walsh, 2006: 5). As I have already said, all of Maria's lessons (particularly those taught in students' L1) featured IRF sequences. Such sequences have been criticised for giving too much talk time to teachers and limiting student input. Kasper (2001) argued that this situation can be improved if teachers offer greater participation rights and a more central position in the interaction to learners.

In her L1 lessons, students contributed more, by asking questions and making unsolicited comments. This was probably due to their greater level of confidence in their own language than in English. However, Maria used some techniques in the L1 lessons that seemed to result in a higher proportion of student participation.

Kasper (2001) suggested ways in which teachers offer more participation rights in the conversation, by assigning different interactional status to students. In her study, two of these students had the role of primary players, to whom the teacher showed more attention, treated their contributions as knowledgeable and relevant and were given more rights to participation. Alongside the primary players were supporting staff (also students) who received less teacher attention and whose participatory rights decreased as the semester progressed.

In her L1 lessons, Maria often nominated a student called Laia by name, and used her at times to help explain concepts. In this extract, a question from Laia enables Maria to clarify a point about bionic and covalent bonds.

Extract 5.30. Lesson 13 (Maria)

Line	Speaker	Catalan transcript	English translation
77	S (Laia)	podria ser per què és impermeable?	could it be that it's impermeable?
78	T	Quina diferència hi ha entre estar així i estar així? ((T dona instruccions al S de com posar-se)).	what's the difference between being like this or like this? ((T demonstrates by linking arms with a student))
79	S1	que ocupa menys	it takes less space
80	T	que ocupa menys, molt bé, què més?	it takes less space.. very good what else?
81	S2	que al estar junts...	that you are together.
82	T	en realitat estem així, no?	in reality we are.. aren't we?
83	S	és més fàcil de separar	it's easier to separate
84	T	molt bé. Això és més fàcil de separar que això. L'enllaç que té la sal és aquest, l'enllaç que té la calcita és aquest ((T escriu l'enllaç a la pissarra)). Ho enteneu? Això es diu enllaç biònic i l'altre es diu enllaç covalent, vale? Digues.	very good.. this is easier to separate than this.. the link that has the salt is this one.. and the link that has the calcite is this one.. ((T draws the link on the blackboard)) do you understand? this is called a bionic link and the other is a covalent link.. ok? yes?

Line	Speaker	Catalan transcript	English translation
85	S (Laia)	però, aquest es pot separar encara que sigui rígid?	but can this be separated even if it's rigid?
86	T	es pot separar, sí Laia. L'àcid consegueix separar-ho perquè té més força que l'aigua sola. L'àcid ho aconsegueix separar, vale?	you can separate it yes Laia.. the acid will separate it because it is stronger than water on its own.. the acid achieves the separation.. ok?

Laia appeared to be a primary player in this L1 lesson, whereas in the CLIL lessons, Maria very rarely nominated any students by name. The L1 lessons seem to be less tightly controlled by Maria, with students taking a more active role. Earlier in this chapter, we saw that in lesson 12, students at times tried to take Maria off topic with questions. In this extract, from lesson 13, students prevent Maria from moving on to a new subject, even though she had clearly told them she wants to teach something else. However, a comment from a student leads her to add to her previous explanation before moving on.

Extract 5.31. Lesson 13 (Maria)

Line	Speaker	Catalan transcript	English translation
18	T	exacte, o sigui, es desfan i es barregen amb l'aigua, val? Ara tornarem perquè us vull ensenyar una altra cosa, val?	exactly it dissolves and is mixed with the water.. ok? now let's go back because I want to teach something else ok?
19	S	es desfan i es barregen amb l'aigua.	it dissolves and is mixed with the water

Line	Speaker	Catalan transcript	English translation
20	T	si, es tornen en partícules molt petitones que queden barrejades amb l'aigua, val? I per què diem que la mescla entre l'aigua i el sucre és una mescla homogènia? Per què ho diem?	yes.. it becomes very tiny particles that are mixed with water,..okay? and why do we say that the mixture between water and sugar is a homogenous mixture? why do we say that?
21	SS	perquè no es veu	because you can't see it
22	T	perquè no es veu, què?	because you can't see what?
23	S1	els components del sucre	the components of the sugar
24	S2	a ull nu	to the naked eye
25	T	el què? exacte	the what? exactly
26	S	(xxxx)	(xxxx)
27	T	molt bé, molt bé. No es distingeixen a ull nu ni amb el microscopi les substàncies que el formen, val? Aixó és l'apartat B: per què diem que la mescla entre l'aigua i el sucre és una mescla homogènia? Perquè no podem distingir les substàcies que el formen a ull nu.	very good, very good. the substances that it's made of are not visible to the naked eye or with a microscope.. okay? this is section B: why do we say that the mixture between water and sugar is a homogenous mixture? because we cannot distinguish the substances it is made of with the naked eye.

Discourse markers

Maria used discourse markers in the L1 lesson to encourage students and grant them interactional space. She often elicits with the word *algú* (anyone) which works well in encouraging answers from more than one student.

Extract 5.32. Lesson 13 (Maria)

Line	Speaker	Catalan transcript	English translation
69	T	aviam. Algú se li acut per què la calcita no s'ha desfet? És una cosa molt difícil, eh?	let's see.. does anyone say that the calcite doesn't dissolve? it's difficult isn't it?
70	S1	perquè tantes partícules juntes no es desfan...	because many particles don't dissolve together
71	S2	perquè és sòlid	because it's solid
72	S3	perquè si...((no acaba la frase))	because if...((doesn't finish the sentence))

She also said 'digues digues' (tell me tell me) to encourage students to speak, and 'que més' (what else) to elicit more from them.

Extract 5.33. Lesson 13 (Maria)

Line	Speaker	Catalan transcript	English translation
5	T	Per què surt una mica terbula? Doncs, perquè té calç, no? Però...digues, digues	why is it a little cloudy? well, because of calcium, isn't it? but, tell me, tell me

We also saw, at the beginning of this chapter in extract 5.1, that Maria uses markers in her instructions such as *doncs* //so//, *vale* //ok// and *llavors* //then//. In English, however, Maria has a smaller repertoire of discourse markers. She does not use any that encourage speaking, like ‘tell me’ or ‘anyone’. The ones she uses, are those that give students clues to let them know she is rounding up a point, for example, ‘then’ in extract 5.2. She also uses ‘so’ in a similar way (see extract 5.34) and she frequently uses ‘ok?’ to check that students are following the thread of a lesson.

Extract 5.34. Lesson 2 (Maria)

Line	Speaker	Transcript
12	T	a tap //cork// ok.. so number 3 you have to write here number 3 ..and what is the number 1 tap water?
13	S	water
14	T	water ok from where?

Musumeci (1996) describes how teachers fill in the gaps and use 'smoothing over' techniques to make a coherent story out of student contributions. Maria used this technique in her L1 lessons. As we saw in extract 5.31, Maria’s exchange with a student served to help Maria clarify the meaning of a homogenous mixture to the rest of the group, which she then summarised in her final turn.

The control of patterns of communication in Maria’s lessons seems to indicate that she granted more interactional space to leaners in the L1 lessons, than in the CLIL environment, a concern that was raised by Maria and Belén during the course, who both felt that students in the CLIL lessons were sitting passively and not participation as much as they should or could.

Modifying speech to learners

Moje (1995) observed that students progress faster and further in science classrooms if they are appropriately equipped linguistically. In both her L1 and CLIL lessons, Maria made sure that students understood the key vocabulary and scientific terminology needed to participate in the lesson. In the CLIL lessons, this often involved giving students a matching task on a worksheet or holding up various pieces of equipment and pointing to them in the room. Moreover, she often asked students to give her the Catalan word to make sure they had understood. Most of this vocabulary was familiar to the students in Catalan, but they needed to learn it in English.

In contrast, in her L1 lessons, the vocabulary Maria explained was entirely new to most learners in Catalan and was more scientific. She used different strategies to teach the vocabulary in these lessons and explained concepts verbally, for example, when she explained the word ‘res’ in extract 5.35 (below). Another technique she used in her L1 lessons was to mime or act out a concept with the help of a student. She does this in extract 5.30 (above) to teach the difference between bionic and covalent bonds.

Extract 5.35. Lesson 13 (Maria)

Line	Speaker	Catalan transcript	English translation
9	T	Mireu, oi que cada vegada està més claret això? ((els hi ensenya el got amb aigua i sal)) què passa? D’anar remenant ho vaig col.locant i, això si ho mirés al microscopi no veuria res, absolutament res. Per què?	see.. that each time it gets clearer? ((she shows them the glass containing the water and salt)) what happens? I stir it and put it down and if you looked at it under a microscope you would see nothing.. absolutely nothing.. why?
10	S	què vol dir res?	what does *res* //nothing// mean?
11	T	res, vol dir veure transparent, totalment transparent...no veuria partícules, ni veuria cap posat entremig, ni veuria absolutament res.	*res* means to see through.. totally transparent.. you wouldn't see particles.. nor anything in between.. you wouldn't see anything

Tardif (1994) identified five modification strategies: self-repetition, linguistic modelling, providing information, expanding an utterance and using extensive elicitation, and grading and adjustment of questions. While Lynch (1996) describes ways teachers modify their interaction with confirmation checks, comprehension checks, repetition, clarification requests, reformulation, completion and backtracking.

Maria adopts many of these techniques in both her L1 and CLIL lessons, but, as we have seen, she tended to be more repetitive in her CLIL lessons (see extracts 5.4, 5.6, 5.13). She was also much more chatty in her L1 lessons and made jokes and asides, not entirely related to the topic, for example, the comment about fairy liquid in extract 5.1. This could be because the CLIL lesson took place earlier in the academic year and she had not built such a good rapport with students, but in the L1 lessons she referred to students more by name (see extracts 5.18 and 5.35) and used jokey discourse markers such as '*si senyor*' to indicate a correct answer. In the CLIL lessons, she uses clearer language to indicate a correct answer, e.g. yes or very good (see extract 5.24), and she stays on topic throughout.

Another technique Maria used in the CLIL lesson was to simplify questions and give students a choice of answers. For example, in this extract, she asks pupils if they think that solids are denser than liquids. She gives them a few seconds to think and then gives them three options to choose from.

Extract 5.36. Lesson 2 (Maria)

Line	Speaker	Transcript
1	T	go to the first part page 1 do you think solids are denser than liquids.. .. always.. in general.. not always or never? what do you think is a good answer?

In her L1 lessons, Maria was less inclined to simplify questions in this way, for example, in extract 5.16 when she asked pupils why we say that water and sugar is a homogenous mixture. This is probably because students were quick to respond with an answer, while in the CLIL lessons we can see that when Maria asks a question, there are sometimes several seconds of silence. Realising that she is not going to get an answer from students, Maria changes her questioning tactic to try and elicit a response.

The way Maria modified her speech to learners demonstrated an awareness of the need for additional support for students learning through English, with the use of repetition and concept checking. A strategy that occurs in the L1 lessons, but not in the CLIL, is that of 'smoothing over' and filling in the gaps to piece together a coherent story out of learner contributions. She also used students as ‘primary players’, to help her teach in the L1 lessons, something she was unable to do in the CLIL lessons, since none of the pupils had the level of English to support her in this way. When we look at Maria’s views on her CLIL teaching experience in chapter 7, we will see that she missed having students to support her in the CLIL lessons, and took the low incidence of student talk as a sign that the lessons were not going well.

5.4. Classroom observations

When I observed Maria’s CLIL and L1 lessons, which she taught to the same students at the same point in the academic year, I noticed some similarities and a few key differences in the way she interacted with students and the way students participated in lessons.

Maria used mime to explain ideas in both the lesson formats. For example, she linked arms with a student in lesson 13 to explain the difference between bionic and covalent bonds. To explain vocabulary, particularly laboratory equipment, in CLIL lessons she pointed them out and encouraged students to do the same. For example whenever she was setting up a new activity in a CLIL lessons, she elicited all of the materials students needed by holding up each item and asking students what it was called in English.

Maria had a more informal and jokey teaching style in the L1 lessons. She said ‘si, senyor’ when they answered correctly, drew on cultural references to give examples and seemed a lot more confident using L1 as the language of instruction. In contrast, in the CLIL lessons, she looked less comfortable, and she used more deliberate language, even in Catalan, to make sure students were following the lesson. There were fewer jokey asides, and as I mentioned earlier, no references to anything from the wider world outside the classroom.

The students as well were more relaxed in Maria’s L1 lessons, which we see in the transcripts, shouting out answers and asking questions. However, I noticed that in the CLIL lessons all of the students participated throughout. This was due to the structured nature of the lessons that involved several activities, for example, a practical activity, a drawing activity and a group discussion, followed by a task on the worksheet. This highly structured lesson format meant that the students always had something to do, and all of them, including the three boys with special educational needs, were actively engaged and participating throughout the lessons. In the L1 lessons, students were mostly watching Maria conduct an experiment and most of the lesson time was spent in transmission mode. While a handful of students were actively involved throughout these lessons, asking and answering questions and taking notes, I observed that several students seemed to switch off. They did not participate actively in the lesson, and while they may have been listening and absorbing all of the information, they could equally have stopped listening after a few minutes and lost the thread of the lesson. Thus, while the level of challenge was higher in the L1 lessons, whether all of the students were actively involved and benefitting from it cannot be confirmed. In the CLIL lessons, on the other hand, all of the students were involved and could not have failed to grasp some of the key learning outcomes of each lesson.

5.5. Curriculum/task (content) analysis

The CLIL unit on the subject of heat that Maria had prepared for students (see Appendix 10) was based on a unit she already used in Catalan (see Appendix 12). The content of the two units was very similar and the learning outcomes remained the same. However, the activities in the CLIL version of the unit had been adapted to support students linguistically. For example, in one activity students answer a series of questions about a practical activity they have just done. In the Catalan version of the activity (figure 5.3), students answer the questions and are expected to be able to expand on their answers and explain why a particular phenomenon occurred. In the CLIL version (figure 5.4), the students are given the words 'yes' and 'no' in bubbles to help them choose the correct answer, and in question 3 they are given a gap fill to help them answer.

Figure 5.3. Catalan questions

Qüestions:

a) Notes la mateixa sensació de calor o fred a les dues mans?

b) Creus que el sentit del tacte ens permet saber la temperatura d'un cos amb la mateix exactitud d'un termòmetre? Per què?

c) Aquí tens un esquema que representa la transferència d'energia tèrmica d'un cos calent a un de fred. Quan finalitza la transferència d'energia?

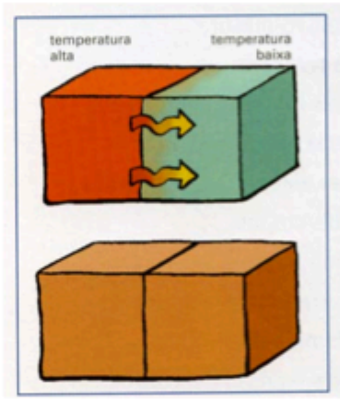


Figure 5.4. CLIL version of the same activity

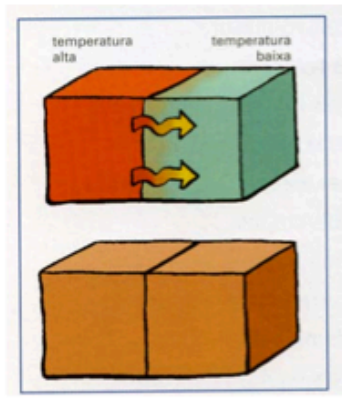
Questions:

a) Do you feel the same sensation of heat or cold in both hands?

b) Do you think that touch allows us to know the temperature of an object as well as (with the same accuracy) with a thermometer?

c) Here you have a drawing that represents the thermal energy transfer from a hot object to a cold one. When does the energy transfer finish?

The transfer of energy finishes when both objects have the _____________ _______________.



This example demonstrates that Maria made an effort to adapt her materials to the CLIL lesson format. She did not change the content of the unit, but rewrote activities to help students answer the questions.

In table 5.11, I present the results of the checklist used to assess whether the key features of CLIL were present in the lessons I observed. Maria was keen to maintain the same level of cognitive challenge and depth of content in her CLIL lessons as in her L1 lessons. However, based on this sample, I would say that the content was considerably easier in her CLIL lessons and students were not stretched on a cognitive level. For example, in lesson 2 the students conducted an experiment in which they put various objects in a beaker of water to see if they would float. During feedback, Maria has to give students the answers, despite trying to elicit them. Students mostly responded with one-word answers (see extract 5.6) and Maria repeatedly asked students if they understood, although she received little confirmation that they had (see extract 5.7). In contrast, in lesson 12 we see a student questioning whether a mixture is an emulsion and providing an example of why she thinks she is right (extract 5.18). In addition, more learning points were covered in the L1 lessons than in the CLIL lessons. Lesson 12, for example, covered light passing through polluted water, the difference between emulsions, mixtures and pure substances, and included a short discussion on photons and neutrons. In both the CLIL lessons, only one main aim was covered in each lesson, for example, that solids are usually denser than water.

Table 5.11 Content analysis of Maria's CLIL and L1 lessons

	Lesson 1 (CLIL)	Lesson 2 (CLIL)	Lesson 12 (L1)	Lesson 13 (L1)
Cognitive challenge	low	low	high	High
Difficulty of content	low	low	high	High
Opportunities for communication (groups)	y	y	n	n
Opportunities for communication (whole class)	y	y	y	y
Cultural aspect	n	n	y	y
Interactive materials	y	y	n	n
Multi-modal input	y	y	y	y
Task-based learning	y	y	n	n

The CLIL lessons featured several opportunities for students to communicate in groups. They mostly used this opportunity to speak to each other in their L1 since they did not have the language necessary to work together in English. However, this opportunity did not exist at all in the L1 lessons. In all of the lessons, there were many opportunities for students to speak to the teacher in the numerous IRFEx sequences. As we have seen, in the L1 lessons, student talk was considerably higher and involved students asking as well as answering questions.

The cultural aspect was only addressed in the L1 lessons. As I discussed earlier in this chapter, Maria had a more chatty and informal style in these lessons, and she drew on students' experience from outside the classroom to give examples. She reminds students of the Fairy liquid ad when she is describing the materials in a practical activity, and she also asks students to think about the kitchen counter in their grandmother's house to give them a personalised example of where they might have seen granite. Similarly, in lesson

12, she uses everyday objects, such as mayonnaise and toothpaste, to explain what an emulsion is. There were no cultural references or personalised examples in the transcripts for the CLIL lessons, which reflects Maria's more structured approach to these classes. This, like the lack of referential questions, could have been a missed opportunity to get students relating the science of the classroom to their everyday lives and could have aided understanding.

Maria's CLIL lessons featured more interactive materials than the L1 lessons. In both the CLIL lessons, students spent much of the lesson participating in practical activities. The CLIL lessons can also be described as task-based as a result. The input was multi-modal in both classroom types, and even though students were not conducting the experiments themselves in the L1 lessons, they were watching them, which provided a rich source of visual information on the subject matter.

Some of the findings of this curriculum and task analysis reflect Maria's knowledge of CLIL methodology, such as the way she made her lessons task-based and provided students with interactive materials. However, the lower cognitive challenge and depth of content that I perceived in Maria's CLIL lessons was in contrast to her view expressed in her interviews (see chapter 7) that she wanted to maintain the level regardless of students' English proficiency. Despite these intentions, she was forced to address fewer topic areas and bring the level of challenge down to suit students' capabilities. Even though Maria would have studied the 4Cs (Coyle, 1999), finding a way to introduce culture into the science lessons would not have been a priority, and could have proved challenging. On the other hand, seeing how naturally she found ways to link the content of the lesson to students' cultural knowledge and background in the L1 lessons shows that she may have missed an opportunity to do the same in her CLIL lessons.

5.6 Conclusion

This chapter has looked at Maria's CLIL and L1 lessons using the IRFEx-framework as a unit of analysis. The main differences between the lesson types that emerge from this method of inquiry are as follows:

- The L1 lessons appear more dialogic in the way Maria and her students freely swap traditional teacher and learner roles, with students asking, as well as answering questions, and Maria using student contributions to try and construct a coherent story for everyone to follow. While Maria feels that this more interactive style of teaching is inherently better, its usefulness may be superficial as students quite often make unhelpful comments or use up classroom time by going off-topic.

- In the L1 lessons, the content is very fast-paced and some complex issues are only touched on briefly before a new topic is introduced. Furthermore, it also seems that just one or two students might be making the majority of contributions.

- The L1 lessons are almost entirely comprised of IRFEx sequences, whereas the CLIL lessons have more variety e.g. a practical activity followed by an IRFEx sequence for feedback, a worksheet activity and then another IRFEx sequence for feedback. This more scaffolded lesson structure means most themes are covered several times in one class, which Maria cites as a reason for student success in the end of unit exam.

- The typology of questions asked is almost the same in both environments. Maria asks more vocabulary and reformulated questions in the CLIL lessons and elicits slightly fewer science explanations, but she asks more open questions in the CLIL environment. However, fewer referential questions are asked in the CLIL lessons. This reveals Maria's priorities for the CLIL lessons to be more about teaching and checking understanding of a few key scientific points, rather than encouraging students to talk.

- I perceived the level of cognitive challenge and difficulty of content to be lower in the CLIL lessons, due to the slower pace and more basic nature of teacher explanations and student questions.

- There is a more varied and fluid series of interactions in Maria’s L1 lessons, with more scope and space for learner involvement.

- The high incidence of managerial mode in the CLIL lessons demonstrates a more structured lesson format.

- When we look at the content analysis, we see that Maria simplified tasks in the English dossier she produced, which was based on one she already used in Catalan. She also covered more content in the L1 lessons and elicited answers from students that demonstrated their understanding. In the CLIL lessons, there were fewer signs from students that they had understood.

- All of the students were actively engaged and participating in the CLIL lessons due to the interactive nature of the activities. In the L1 lessons, on the other hand, only a few of the students were actively participating in discussion with Maria, although the level of the discussion was higher.

Chapter 6. Results and discussion: other teachers' CLIL lessons

6.1 Introduction

This second data chapter looks at the CLIL lessons taught by the other teachers in the study, in order to compare them with Maria's CLIL lessons. The same methods of inquiry are used: an analysis of discourse based on SETT modes and IRFEx patterns of interaction. In addition, I look at the teachers' control of patterns of communication, their use of discourse markers and the way they modify their speech to learners, features that fall outside of the scope of SETT and IRFEx. The teachers featured in this part of the study are Belén (an experienced secondary school teacher working with Maria in the school in La Garriga), Joanna (a teaching assistant from the UK working with Maria and Belén) and Albert (a secondary school teacher working at a different school in the centre of Barcelona).

Although the comparison of Maria's CLIL and L1 lessons is a major focus of this study, an analysis of CLIL lessons taught by additional teachers will act as a comparison point even if this does not make for a scientific sample. It will be useful to identify if all of the CLIL lessons in this study share any similar characteristics or if they produce any very dissimilar approaches. While I will not make any general conclusions about 'CLIL in Catalonia' I will be able to compare the nature of interactions across three different settings, and the broader evidence will enhance the depth of the analysis.

6.2 The SETT Framework in Albert's and Belén's lessons

In chapter 5, I compared Maria's CLIL and L1 lessons using Walsh's SETT framework (2006). With regard to Maria's L1 lessons, a more varied pattern of SETT modes emerges, with more frequent mode switches occurring during the course of a lesson. This contrasts with her CLIL lessons, which feature fewer changes between modes and a higher incidence of managerial mode to explain and manage tasks, along with a greater reliance on materials to support learning.

In this chapter, four lessons taught by Albert and Belén are analysed using the same SETT framework to see if their CLIL lessons display similar features to Maria's CLIL lessons. I chose not to include lessons by Joanna in this numerical SETT analysis, as the lessons she taught had quite a specific format, suited to her role as a teaching/language assistant. They were materials-based classes going over the answers to homework pupils had done over the weekend, and consequently, they contained little variety in terms of SETT modes.

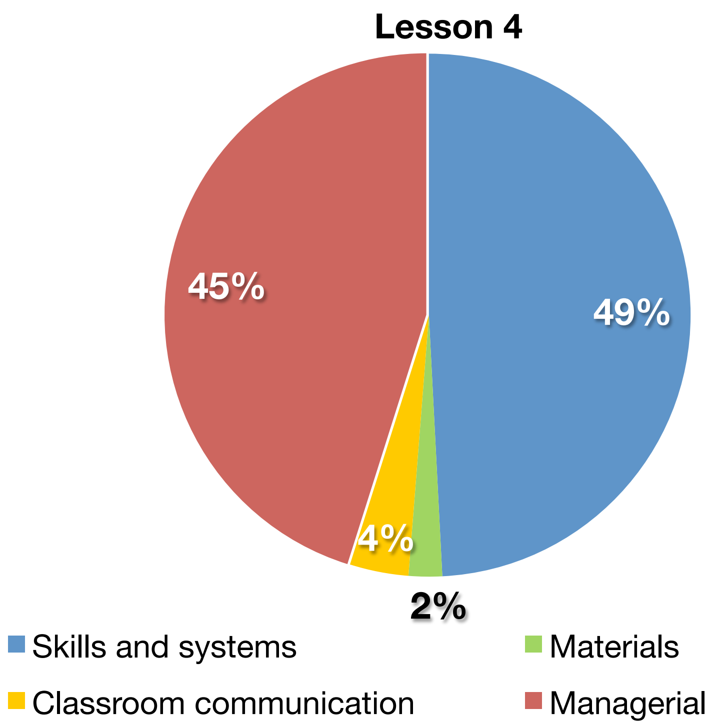
Table 6.1 lists the four lessons taught by Albert and Belén that were analysed using the SETT framework. Although all four lessons deal with the topic of heat, they vary in format. In Belén's two lessons, pupils spend much of the lesson working on practical activities, and in this case fewer exchanges take place between the teacher and pupils. Where exchanges do occur, it is to give instructions for a task and to round it up with results and conclusions. In Albert's first lesson, he conducts an experiment in front of the class, so a proportion of the lesson involves talking through instructions, results and conclusions. While in Albert's second lesson, which has the highest word count, pupils work on written activities. This means most of the discourse involves giving instructions or feedback.

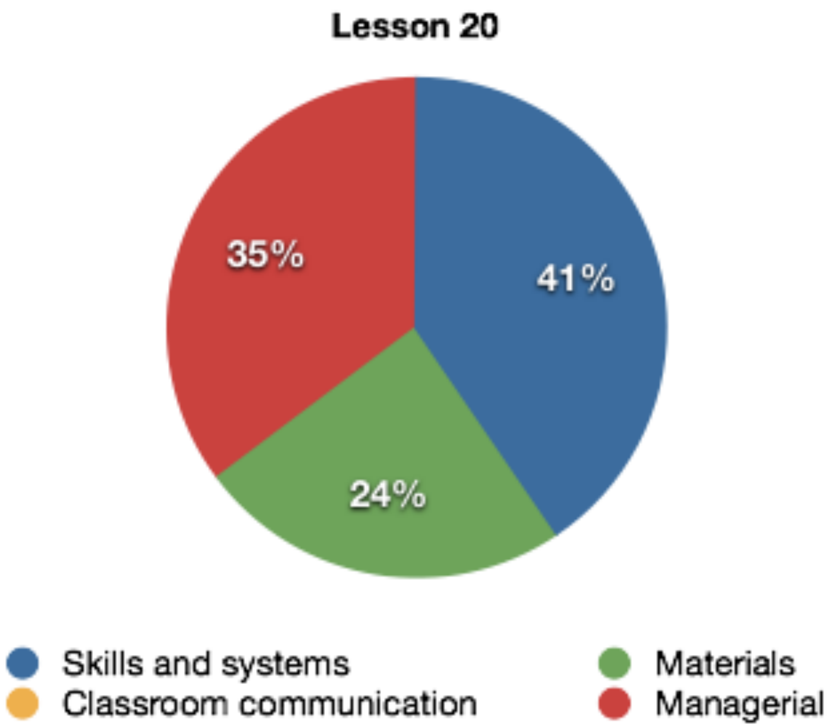
Table 6.1 Albert's and Belén's lessons included for SETT analysis

Name of lesson/teacher	**Date**	**Number of students**	**Topic**	**Lines of discourse (turns) categorised into SETT modes**	**Word count in lesson (average length of turn)**
Lesson 16 (Belén)	4/3/09	8	Heat	155	1288 (8.5)
Lesson 19 (Belén)	25/03/09	11	Heat	88	1225 (14)
Lesson 4 (Albert)	15/5/09	22	Heat	71	1405 (19.5 words)
Lesson 20 (Albert)	7/3/09	22	Heat	217	4054 (18.5)

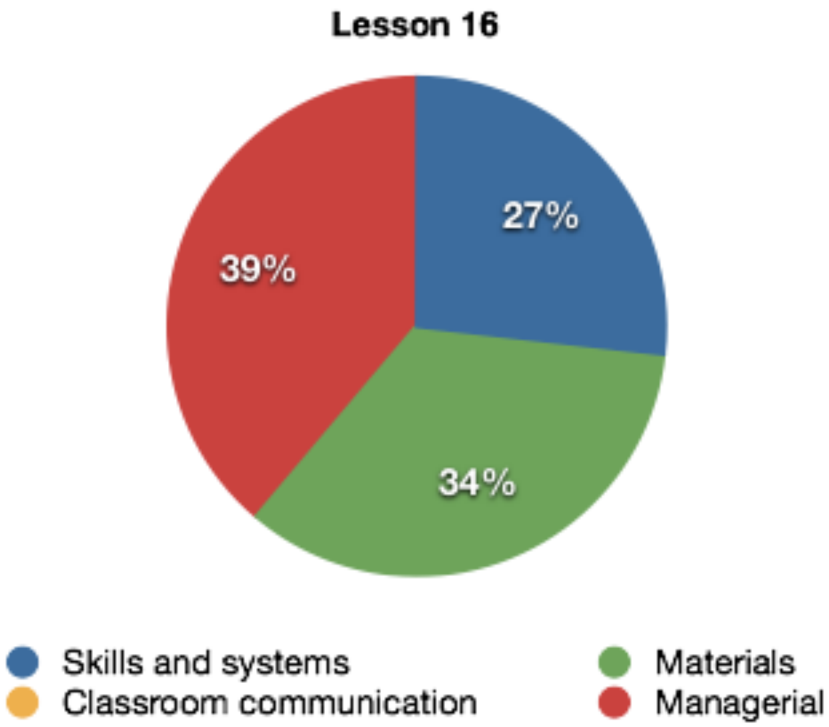
Figure 6.1 Breakdown of each lesson by SETT mode

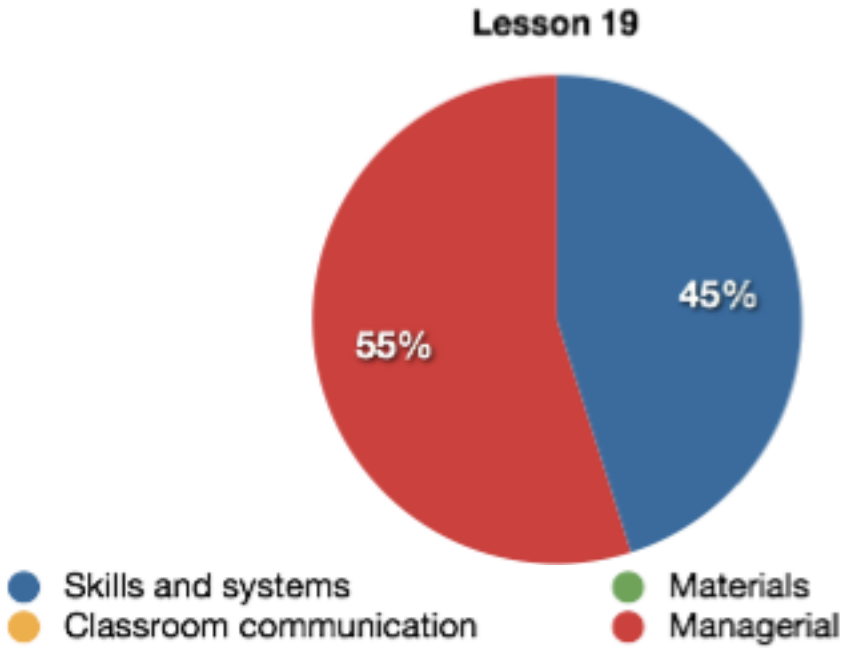
Albert's lessons (lesson 4 and lesson 20)





Belén's lessons (lesson 16 and lesson 19)





Outline of the lessons

Belén's lesson 16 begins with a vocabulary task to introduce key language, such as 'feel', 'lukewarm', 'hot' and 'cold', to give pupils linguistic support for the experiments they are going to do. In the lesson, pupils do two experiments. In the first, they have three bowls of water: one hot, one cold and one lukewarm. Pupils first put one hand in the cold water and the other in the hot water for a few seconds. Then, they put both hands together into the lukewarm water and record whether their hands feel hot or cold. In the second experiment, they pass a metal ball through a hole to show that it is small enough to pass through. After that, they heat the ball to see if it still fits through the hole. Before each experiment, Belén elicits predictions from pupils and then rounds up each one with conclusions that pupils note down in their dossiers.

In lesson 19, pupils conduct two experiments about heat. The methodology behind the lesson is model-theory (Gilbert and Ireton, 2003) in which pupils build a model to help them understand a particular scientific concept. In this case, pupils are given tin cans that represent hippos and elephants. The cans that represent elephants have large metal 'ears' attached to them, while the cans representing hippos have no ears at all. Pupils fill the cans with hot water and then measure the temperature of the water in the cans to see which ones cool down faster. The idea is that the cans representing the elephants will cool down faster with the help of their ears, which act as a cooling system. In the second experiment, test tubes represent penguins. Each test tube is filled with hot water, and the test tubes are put in different formations, for example, in a line, in a huddle and apart. Pupils measure the temperature of the water in the test tubes in order to discover how heat is conserved.

In lesson 4, Albert conducts a series of experiments in front of the class to demonstrate the effect of heat on liquids and gases. Throughout the lesson, Albert refers pupils to a printed dossier to introduce the experiment, record the results and make conclusions about what happens. The object of the lesson is for pupils to learn that particles move faster when they are heated. To round up, Albert plays pupils a video of a balloon inflating when air in a flask is heated, to reinforce the points of the lesson.

Lesson 20 does not involve any experiments. Instead, pupils work through a series of activities in a printed dossier to help prepare them for an exam the following week on calculating potential energy and kinetic energy. Most of the discourse is concerned with setting up written exercises, and going over the answers with the whole group. Lesson 20 has the highest word count of these four lessons, because a larger proportion of the lesson is spent in transmission mode. In the other three lessons, particularly in Belén's classes, pupils spend a much greater proportion of the class working on practical activities, leaving less time for recordable teacher and student talk. This could have been a rich time for interaction and discussion, but was not. This was because students were not given any useful language which may have helped them express their ideas in English. While they worked well together in their groups and collected and shared their data, they did so almost entirely in Catalan.

Prevalence of managerial mode

As in Maria's CLIL and L1 lessons, managerial mode dominates Belén's and Albert's classroom discourse. In this extract, Belén uses managerial mode to set up a practical activity and presents the equipment students will need to do the experiment.

Extract 6.1. Lesson 19 (Belén)

2	T	.... now each group have to fill the two cans with hot water with the same measure of water ok.. we can use this instrument and the funnel.. where is the funnel? Jordi //where is the funnel?//
3	S	//here//

Managerial mode is also used to round up activities and introduce new ones. In this extract, Albert is completing an explanation of what happens to the particles in water when they are heated. To ensure that students not only have understood this, but that they make a note of it, he immediately switches to managerial mode and tells them to write a short explanation of the phenomena.

Extract 6.2. Lesson 4 (Albert)

47	T	... and if they move faster the volume gets?
48	S	bigger
49	T	bigger yes.. try to write some lines explaining this experiment.. please explain this has happened.. please write two or three lines explaining why this has happened.. dilitation, hot water, heat transfers from hot water to blue solution.. please write two or three lines now

In Maria's CLIL lessons, she uses managerial mode to provide more regular summaries than in the L1 lessons, leaving no more than 13 lines between summaries in her CLIL classroom, but sometimes waiting as long as 34 lines when she conducts the lesson in Catalan. Albert does not provide as many summaries as Maria. This could be because he relies more on materials in his lessons and knows that pupils have a written record in front of them. When he does stop to summarise a point, he invites students to write it down. Here, in lesson 20, Albert wants students to grasp that molecules move more depending on their level of thermal energy.

Extract 6.3. Lesson 20 (Albert)

149	T	... a molecule is a group of atoms which are together.. and together as a group they move.. yeah.. they move.. and if they move a lot this means a lot of thermal energy.. yeah.. the more thermal energy they have the more they move.. you understand this sentence? please write down this sentence.. it's interesting that you learn this expression ((writes on board)) the more thermal energy molecules have the more they move.. yeah? interesting that you learn this expression.. the more da ta da.. the more da ta da.. do you understand it?

This extract is also interesting in the way that Albert models and explains language, something I look at in more detail later on in this chapter.

Belén uses managerial mode in a similar way after pupils have conducted each experiment. A key difference between Belén and the other teachers in this study is that while she is happy to set up an activity and elicit answers from pupils using English, she switches to Catalan to summarise. In her interview, Belén expressed doubts about her level of English and ability to explain ideas clearly using the language. This doubt is reflected in her teaching practice, and while she feels confident using English for the tasks that demand lower linguistic skills, for example, teaching the vocabulary of equipment used in an experiment, she chooses to use L1 for explanations that require a more skillful use of English.

Materials and skills and systems modes

Albert relies more heavily on materials than Belén. In fact, in Belén's lesson 19, materials mode does not occur at all. This is due to the format of these particular lessons rather than a fundamental difference in teaching style between the two teachers. In both Albert's lessons, he is teaching a group of 22 students, and while the location is a laboratory, only Albert conducts experiments. Belén, on the other hand, has a reduced group, and the main purpose of the two lessons is for students to conduct an experiment. Similarly in Maria's lessons, less time is spent in materials mode when she is teaching a smaller group in the laboratory than when the lesson takes place in a classroom.

Despite this, Belén's and Albert's lessons have quite a similar format in terms of their breakdown of SETT modes (see figure 4.1). In particular, there is a relatively high proportion of managerial mode and almost no classroom communication. Materials mode and skills and systems mode, while distinct enough to warrant separate modes, have much in common and are characterised by IRFEx sequences and display questions. Since these sequences are the bread and butter of all of the CLIL lessons included in this study, it is not surprising that these modes take up roughly half of classroom time. These SETT patterns correspond to those of Maria's CLIL classes, which are also dominated by managerial mode and feature no classroom communication. Conversely, Maria's L1 lessons include far shorter stretches of managerial mode and some classroom communication.

Like Maria, both Albert and Belén sometimes depart from the main mode to a secondary mode (usually managerial) for a 'mode side sequence'. Albert, in particular sometimes reminds students to make a note of something or to be quiet in the middle of a sequence of materials mode discourse.

Extract 6.4. Lesson 20 (Albert)

63	T	If you have a contribution //if you have a contribution//.. something interesting to say.. it would be better if you raised your hand..

In summary, we have seen that Belén's and Albert's CLIL lessons, when viewed through the lens of the SETT framework, share with Maria’s CLIL lessons the need for more managerial mode than we saw in Maria’s L1 lessons. This is due to teachers spending more time introducing a topic and rounding it up, and prompting pupils to make notes when a key point is summarised. In Maria's L1 lessons, she used just a few words to move the lesson from one stage to the next, while in all the teachers' CLIL lessons, more (and often repeated) words were needed. The other main issue that emerges from this analysis is the lack of classroom communication that takes place. This is something that both Maria and Belén lamented in their interviews and see as a problem that needs to be resolved. As we will see in the next section of this chapter on scaffolding, the way lessons are structured (and in particular, how they begin) makes a great difference to pupils' ability and willingness to contribute to a lesson.

6.3 Scaffolding to support speaking

Throughout the transcripts, there are very few examples of pupils speaking in English for more than a few words. In fact, to make the distinction between a long answer and a short one, I chose four words plus, as the criteria of a long answer. While four words is still a very low number, these answers usually indicate a more grammatically complete sentence. Even then, these 'long' answers only occur in around 10% of CLIL answers (37% in L1 lessons). This may be due to the teachers' preference for asking closed, display questions. However, in Dalton-Puffer's study (2007), when teachers tried to use questions that would encourage long answers, students still gave short ones, which she speculates may be due to their familiarity with the roles and conventions of triadic dialogue. Similarly, in the transcripts in this study, we sometimes see teachers trying to coax a longer answer out of pupils, but then jumping in to help out when they get stuck. We see this in the following extract from lesson 18, in which Belén asks pupils to predict what will happen in an experiment.

Extract 6.5. Lesson 18 (Belén)

22	T	it's possible that one of you can explain to Jane what is the activity?
23	S	the penguins?

24	T	yes... in English.. try to explain in English .. and Jane .. if you don't speak correctly.. Jane help you
25	S	together
26	T	together.. the penguins go normally together
27	T (J)	they're like this together ((gestures to show penguins grouped together))
28	T	why?
29	S	because each penguin .. .. //how do you say xx//
30	T	if the penguins are close to one another.. the temperature is higher that if the penguin are isolated in the middle of the xx

This stretch of dialogue occurs early on in lesson 18, and pupils have not received any vocabulary input and do not have a handout containing the language in front of them.

In lesson 16, however, Belén has more success getting an explanation from pupils. This lesson begins with a vocabulary matching task, where students learn the key language they need for the experiment, e.g. ‘ball’, ‘setting’, ‘go through’. As a result, pupils are better equipped to answer Belén’s question.

Extract 6.6. Lesson 16 (Belén)

95	T	would you try to explain this in English?
96	S	because the particles in the ball are now xx
97	T	please... xx is speaking... explain the xx
98	S	the ball is more big
99	T	bigger?
100	S	yes.. more bigger
101	S	more bigger no ... bigger
102	T (J)	bigger
103	S	bigger and no pass for the ring
104	T	through the ring... this is a hypothesis...

In addition to having completed a matching task at the beginning of the lesson to learn the key vocabulary, pupils also have the handout in front of them. It is possible that the pupil who answered the question could have been looking at the page, but the presence of grammatical mistakes in his answer, suggests that this was a spontaneous answer rather than a line read out from a handout.

Albert experiences similar problems in his lessons, and pupils sometimes choose to answer a question in Spanish, as in this extract from lesson 4.

Extract 6.7. Lesson 4 (Albert)

19	T	do you know what has happened?
20	S	//yes the particles move more//
21	T	in hot water the particles move quicker...

This question occurs early in the lesson before any vocabulary has been taught. Later in the same lesson, pupils answer questions about the results of an experiment in English.

Extract 6.8. Lesson 4 (Albert)

45	T	... when the liquid is warm or hot what happens to the particles?
46	S	faster
47	T	faster yes and if they move faster the volume gets?

In the intervening minutes, Albert has given pupils a handout on liquid dilitation, and they have read a text out loud together as a way to present the key language. As a result, pupils now have the necessary vocabulary in front of them to answer the questions.

These extracts support the idea that pupils need language support to be able to communicate effectively in CLIL lessons and that scaffolding can also be in written form and elective rather than structured by the teacher orally as a need arises.

6.4 The IRFEx Framework

In chapter 4.1, I presented the results of comparing Maria's L1 and CLIL lessons using the IRFEx coding system I developed (see table 3.10), based on Sinclair and Coulthard's IRF Framework (1975). Here, I will look at the other teachers' lessons to see in what ways they are similar to Maria's CLIL lessons. A larger sample of lessons (see table 3.8) is included for analysis here, including lessons taught by the teaching assistant, Joanna.

6.4.1 The I-move: Levels of challenge and the role of questions

As we saw in section 4.1, the questions a teacher asks can tell us both what their expectations of students are and what their pedagogical goals are for that lesson. In Maria's L1 lessons, we have already seen that she asks pupils more questions that demand an explanation or description, while in her CLIL lessons, she focuses more on questions about vocabulary and facts. She also reformulates questions to a much higher degree in her CLIL lessons (see table 5.2).

Table 6.2. Questions by type (Maria's CLIL and L1 lessons and other teachers' CLIL lessons)

	Maria's CLIL	As a % of total	Maria's L1	As a % of total	Other teachers' CLIL	As a % of total
Vocabulary question	15	25%	16	9%	31	25%
Science fact (open and closed)	31	51%	76	45%	42	34%
Science explanation (open and closed)	3	5%	20	12%	11	9%
Description	8	13%	33	19%	16	13%
Reformulation or clue	4	7%	1	0,60%	20	16%
Other elicit	0	0	24	14%	3	2%

As we can see from table 6.2, when we combine the totals of the other teachers' CLIL lessons, they are very similar to Maria's CLIL lessons in their use of questions. The other teachers ask the same proportion of vocabulary questions (25%) as Maria, which shows that they were all checking pupils' understanding of key terms when they use English as the language of instruction. Moreover, they ask the same proportion of questions asking for descriptions (13%), which is lower in the CLIL lessons than in those taught in Catalan. As I have already argued, this could be a missed opportunity, since pupils may be more able to tell the teacher about what they can see, hear or smell, than why something has happened. The other teachers ask a slightly higher proportion of reformulated questions (where they give clues to pupils) and very few other elicits. In my opinion, this reflects their commitment to sticking to the lesson plan and not going off topic, which Maria sometimes does.

The other teachers ask pupils for more science explanations than Maria does, but the proportion is still very low and shows all the teachers favour fact checking.

Table 6.3. Questions by type (Albert, Belén and Joanna)

	Albert	**As a % of total**	**Belén**	**As a % of total**	**Joanna**	**As a % of total**
Vocabulary question	12	24%	8	26%	11	30%
Science fact (open and closed)	16	32%	2	6%	19	53%
Science explanation (open and closed)	5	10%	6	20%	0	0%
Description	4	8%	9	30%	3	8%
Reformulation or clue	12	25%	5	16%	3	8%
Other elicit	1	2%	0	0%	0	0%

When we break down the results for each of the other teachers, we see greater differences in their questioning style, which reflect their lesson aims and pedagogical goals, and also their teaching experience and training. Joanna's lessons are very fact and vocabulary-based, reflecting her lesson aims of going over the answers to homework. She has a language rather than a science background, and admitted that she did not always understand the science content of the lessons, which may also explain why she adhered to the plan and did not ask questions that could take pupils in other directions. The level of challenge of her questions is also quite low, and she often gives pupils a choice of two potential answers to help steer them towards a correct answer (see extract 6.25).

Belén asks very few questions for facts, and elicits more descriptions and explanations, which is consistent with her belief that the challenge should remain high in CLIL lessons, regardless of any language problems. Belén is the only science teacher in the study not to have had any specific CLIL training, although she has Maria as a colleague to share materials and discuss teaching strategies with. A problem that frequently arises in Belén's lessons is that questions are pitched too high for pupils in terms of their linguistic capabilities (see extract 6.5). This results in a lower proportion of pupil response in terms of number of turns or the amount of words they use, and causes Belén to answer a question herself, or switch to Catalan for a few minutes while everyone catches up.

Of the three other teachers, Albert's questioning style most closely resembles Maria's, although the high proportion of reformulations and clues he gives to prompt students sets him apart from the others. When Albert asks a question, he gives pupils the chance to hear the same question posed in a different structure to increase their chances of understanding. For example, in this extract he could limit his question to, 'What is inside the flask?' Instead, he uses several short sentences to set up the question. In this way, he preempts pupils saying, 'nothing', and encourages them to think what might be inside the empty flask.

Extract 6.9. Lesson 4 (Albert)

Line	Speaker	Transcript	IRFEx event
63	T	look watch this.. we have a flask.. an empty flask but the flask is not empty it's empty //empty// but it's not empty.. what's inside the flask? there's something in the flask?	I6E Asks students to describe something

Display vs referential questions

One of the differences that emerged in the types of questions asked by Maria in her L1 and CLIL lessons was that she was slightly less inclined to use referential questions in her CLIL lessons. Instead, she relied on display questions to check students' knowledge and understanding of facts. This tendency is also evident in the other teachers' lessons. In Albert's and Joanna's lessons, all questions are display rather than referential. However, in Belén's lesson 19, there is one section where Belén and I are collecting the pupils' experiment results, and we ask them some questions we do not know the answers to. The students have been measuring the temperature of water in test tubes in different formations to see which ones retain their heat. In this stretch of dialogue, pupils are very engaged, shouting out the temperatures they have collected. They get so excited that they start to misbehave and shout out random expressions in English, one of the few times in any lesson in the study where pupils are not completely under control.

Extract 6.10: Lesson 19 (Belén)

Line	Speaker	Transcript	IRFEx event
46	T (J)	the one in the middle.. what’s the temperature?	I6E Asks student to describe something
47	S1	I don’t know	R1E Short answer
48	S2	64	R1E Short answer
49	T (J)	and the outside one?	Ex6E Extension question asking student to describe something
50	S	er whoah er no 60	R1E Short answer

Line	Speaker	Transcript	IRFEx event
51	T (J)	60, ok.. write it down.. has anyone got a pen?	F1E Accepts answer I0E Other elicit
52	S	64	R1E Short answer
53	T (J)	64 60.. have you got a pen?	F1E Accepts answer I0E Other elicit
54	S1	I'm singing in the rain	These next two lines are not coded as IRFEx events, as students have gone off topic are no longer participating in an exchange about the content.
55	S2	welcome to the fiesta por favor	
56	T	((Belén tells pupils to behave, in Catalan)	

It is possible that the students misbehave at this point in the lesson as I am not their usual teacher, although in other parts of the lesson (e.g. when I elicit answers to a vocabulary task) they are perfectly behaved. Another factor is that they may have found it liberating to give answers to questions that the teacher did not know the answer to, and this brought out their rebellious side. Referential questions are seldom seen in CLIL lessons, and are only occasionally asked in L1 lessons, so when pupils are given the opportunity to answer a real question, they are confused by the power it gives them, and misbehave as a result.

Open questions promote longer and more complex answers (Musumeci, 1996), and for this reason are favoured by teachers who want to encourage communication in their classrooms. This strategy is adopted by Maria in both her CLIL and L1 lessons and also by the other teachers in the study (see tables 6.4 and 6.5). However, in the CLIL lessons, open questions are as likely to elicit a short answer as closed ones, as we see in this extract from Albert's lesson 4.

Extract 6.11. Lesson 4 (Albert)

Line	Speaker	Transcript	IRFEx event
63	A	Look watch this.. we have a flask.. an empty flask but the flask is not empty it's empty //empty// but it's not empty.. what's inside the flask? there's something in the flask?	I6E Asks student to describe something
64	S	gas	R1E Short answer
65	T	yes.. of which gas?	F1E Accepts answer Ex2E Follow up question eliciting a fact
66	S	//air//	R1C Short answer in L1
67	T	air yes //air//	F1E Accepts answer

In this example, the short answers ‘gas’ and ‘air’ are sufficient to answer the questions Albert is asking. Perhaps in their L1, students will have been more inclined to put the answer into a sentence, for example, ‘there is gas in the flask’. Even so, this style of questioning would probably not lead to a detailed answer in either English or L1.

Table 6.4. Open vs closed questions (Maria’s CLIL and L1 lessons and other teachers’ CLIL lessons)

	Maria's CLIL lessons			**Maria's L1 lessons**	**Other teachers**		
	All	English	Catalan		All	English	Catalan
Open	30 (71%)	24 (57%)	6 (14%)	74 (65%)	58 (81%)	56 (97%)	2
Closed	12 (29%)	11 (26%)	1 (2%)	39 (35%)	12 (19%)	12 (100%)	0

Table 6.5. Open vs closed questions (Albert, Belén and Joanna)

	Open question	**Closed question**	**Total**
Albert	15 (71%)	6	21
Belén	17 (80%)	5	21
Joanna	15 (93%)	1	16
Total for three teachers	47 (81%)	12	58

One approach, which Albert uses on more that one occasion to encourage student participation, is when he asks them to give examples of a particular phenomenon, e.g. units of time or energy (see extracts 6.12 and 6.16). Despite encouraging only short answers, this is one of the most effective ways of encouraging student participation that we see in the transcripts. The strategy works because Albert asks students questions he knows that pupils have the scientific knowledge to answer, and he phrases it in such a way that pupils do not need to construct a grammatically correct sentence in order to contribute.

Extract 6.12. Lesson 20 (Albert)

Line	Speaker	Transcript	IRFEx event
198	T	.. now let's turn to energy.. how many units of energy do you know?	Ex2E Follow up question open science fact. Could be classed as a referential question, as Albert does not know how many units of energy the students know
199	SS	joules	R1E Short response
200	T	joules	F1E Accepts answer
201	SS	watts	R1E Short response

In this section, we have seen that all of the teachers use very similar questioning strategies in their CLIL lessons, which reveal the shared pedagogical aims of checking the meaning of vocabulary and the understanding of science facts. The questions they ask seem to show low expectations of students' levels, for example, in Joanna's checking of vocabulary and Albert's eliciting of types of energy. These questions do have a positive result, though, in allowing pupils to give some correct answers, and in the case of Albert’s lessons, in English.

6.4.2 The R-move: Dialogic teaching and student involvement

Intro to R-move

While Maria's CLIL classes displayed traditional IRFEx teacher-led sequences, her L1 lessons displayed more fluidity in terms of teacher and student roles, with many I-moves coming from students, and R-moves coming from the teacher (see table 5.6). As I argued earlier in chapter 5, this demonstrates a more dialogic teaching style in action.

Table 6.6. Breakdown of IRFEx moves (Albert, Belén and Joanna)

	Albert	Made by teacher as a %	Made by students as a %	**Belén**	Made by teacher as a %	Made by students as a %	**Joanna**	Made by teacher as a %	Made by students as a %	All three teachers	Made by teacher as a %	Made by students as a %
I-move	18 (10%*)	95	5	30 (20.5%)	90	10	12(9%)	92	8	60 (13%)	92	8
R-move	72(38 %)	7	93	65(45.5 %)	5	95	36 (29.5%)	0	100	173 (38%)	5	95
F-move	62 (32%)	100	0	41 (28%)	100	0	49 (40%)	100	0	152 (33%)	100	0
Ex-move	37 (20%)	97	3	10 (7%)	90	10	25 (20.5%)	100	0	72(16 %)	97	3
Total	189			146			122			457		
*** % shows percentage of each move in lesson e.g. 10% of moves in Albert's lessons were I-moves.**												

The IRFEx sequences in the other teachers' lessons almost exactly mirror Maria's CLIL lessons: teachers dominate the I-, F- and Ex-moves and the students take up most of the R-moves.

Similarly, in Maria's L1 lessons, students ask questions and occasionally get into an argument with Maria when they disagree with a point she is making (see extract 4.5). This does not occur at all in Maria's CLIL lessons, and likewise, there are no instances of pupils getting involved like this in the other teachers' CLIL lessons. Albert is very keen to stamp his authority on his class, and during the few times when it seems to him that pupils are shouting out answers rather than putting their hand up and waiting to be called, he warns them about their behaviour (see extract 6.4). In Belén's class, the few times that pupils make a lot of contributions is when they are playing around (see extract 6.10). As I mentioned before, I think this is because they are overly excited by the task and the freedom they are given to shout out the results to an experiment.

In general, pupils in all of the classrooms observed in the study are very keen to participate and vocalise their opinions. The classroom norms of pupils putting up their hands and waiting to be invited to speak do not exist to the same extent in Spain as they do in the UK. Although teachers try and encourage students to raise their hands, it is difficult to enforce as it is less important in Spanish conversation to wait until someone has finished talking. In fact, rather than being a sign of rudeness, talking over other people shows enthusiasm for a subject (Murray Bosrock, 1997). It is likely, then, that the pupils in this study want to be more involved than their levels of English allow and, as a result, they occasionally make silly contributions to show they are listening.

Student responses and use of L1

Students were quite inclined to give long answers (defined as 4 words or more) in Maria's L1 lessons, but this rate (of 37%) drops to 12% when we look at Maria's CLIL lessons (see table 5.6) and also the other teacher's CLIL lessons (see table 6.7).

There are a number of reasons for this:

- Pupils do not have the linguistic skills in English to produce whole sentences so they give one-word answers regardless of the question type.
- The structure of lessons is different. The CLIL lessons are broken down into lots of stages, with an average of seven or more task types in a one-hour lesson (vocabulary matching, feedback, experiment, feedback, drawing task, etc). This means that many of the questions that are asked relate to a worksheet or an experiment, and are of the 'what is the answer to number 1?' variety.

- In Maria's L1 lessons, she asks students to describe more, and she also asks chattier classroom communication and referential questions, which in turn generate longer, chattier answers.
- In the CLIL lessons, teachers quickly reformulate a question that pupils do not seem to know the answer to, turning it into a closed question that requires a short answer.

Table 6.7. Length of student responses (Albert, Belén and Joanna)

	Albert	**Belén**	**Joanna**	**Total for all three teachers**
Short response in English	23 (41%)	10 (19%)	13(37%)	46 (31%)
Short response in L1	30 (54%)	34 (63%)	17 (49%)	81 (56%)
Long response in English	3 (5%)	5 (9%)	1 (3%)	9 (6%)
Long response in L1	0 (0%)	5 (9%)	4 (11%)	9 (6%)

Pupils give more than half of all their answers in their L1. This shows that pupils are under the impression that using Catalan or Spanish is an acceptable way to communicate in the CLIL classrooms. Different teachers convey this message in different ways. Joanna, as the only native speaker in the study, is able to stick to English when she gives instructions, explanations, praise, etc. However, she is more willing than the other teachers to accept Spanish or Catalan answers. This occurs mostly when she is eliciting the meaning of vocabulary in English, although she could employ synonyms, mime, drawings, etc. here instead.

Extract 6.13: Lesson 7 (Joanna)

Line	Speaker	Transcript	IRFEx event
31	T	.. so the sugar particles are broken down... broke down is?	Ex1E Extension question checking vocab
32	S	//broken down//	R1C Short response in L1
33	T	yeah... by the water into smaller particles that ...	FIE Accepts answer F3E Gives additional explanation

Maria often switches to Catalan as a rapport-building exercise and generally offers a 'molt bé' rather than a 'very good' to praise pupils. In Belén's lessons, she herself readily switches to Catalan when she wants to explain something. This results in pupils thinking that, even during the segments of her lesson that are supposed to be in English, they can contribute in Catalan.

Of all the teachers, Albert has most success getting students to contribute in English. While he does occasionally offer a brief Spanish translation in the middle of a sentence, he is the most able of all the Spanish teachers to maintain English throughout the lesson, and unlike the other Catalan speakers, uses it to welcome pupils and round up a lesson. The times he switches to Spanish are when he wants to discipline the group (see extract 6.4), and when he thinks pupils have not understood a question, he uses Spanish as a prompt (see extract 6.16). When asked a question in Spanish, he does not always translate the question into English, but he does answer the question in English.

Extract 6.14. Lesson 20 (Albert)

Line	Speaker	Transcript	IRFEx event
104	S	//what does ambdos mean?//	R5C Vocabulary question in L1
105	T	*amdos*.. *tant* //both// in old Catalan *tant* //both// in new Catalan.	F5C Responds to a student's question in L1 and then in English

6.4.3 The F-move

Earlier in this chapter, we saw that in Maria's L1 lessons, we see several examples of her using the F-move to weave a coherent stream of content out of pupils' disparate responses to her questions. She would have liked to have used a similar technique in her CLIL lessons, but her attempts are less successful, and she complains in her interview that pupils do not contribute enough. The reasons she is unsuccessful in getting longer responses out of students, is partly due to their limited English levels, but also due to the types of questions she asks (see table 5.2).

All of the teachers in the study try to employ 'smoothing over' techniques (Musumeci, 1996) to use pupil's contributions to construct an explanation. However, as in Maria's lessons, their attempts to construct knowledge through the F-move also rarely achieve their goals. When it is successful, for example, when Belén gets pupils to explain that a ball when heated does not fit through a hole (see extract 6.6), it is because pupils have the vocabulary presented at the beginning of the lesson or on a worksheet in front of them.

The F-move: Repair

In both Maria's L1 and CLIL lessons, she tries to encourage self-repair when pupils provided an incorrect answer, for example, by reformulating the question, giving clues (e.g. extract 5.12) or using intonation (e.g. extract 5.29). However, she uses direct repair for language problems such as pronunciation mistakes. In her interviews, Maria makes it clear that the science is more important than the English aspect of her lessons. Perhaps then, she wanted to get any language problems resolved quickly by correcting them herself (or even ignoring them completely) to allow more time for the science. In addition to this, as a science teacher, not a language teacher, Maria likely lacks the knowledge and experience to encourage self-correction of a language point.

The other teachers in the study correct in a similar way. In this extract, for example, Albert rejects an answer and elicits a correct one.

Extract 6.15. Lesson 20 (Albert)

Line	Speaker	Transcript	IRFEx sequence
52	T	...so one thing we are going to deal with is how to measure temperature. If I give you a pot with water and they ask you the temperature of this water what temperature have this water? how can you give me an answer? ((repeats question in Spanish))	I9E Other type of elicit I8C Repeats question in L1
53	S	xxxxx ((answer in Spanish))	R1C Short response in L1
54	T	but how can you know exactly	Ex4E Extension question requesting an explanation
55	S	//it depends//	R1C Short response in L1

Line	Speaker	Transcript	IRFEx sequence
56	T	no the answer is not //it depends//	F2E Rejects answer (which is very uncommon across all lesson types and teachers)
57	S	with a thermometer	R1E Short response in English (though longer than it could have been. In many similar cases, the student would just have said 'thermometer').

Like Maria, all the teachers directly repair language issues such as pronunciation and grammar. Albert corrects pupils' vocabulary in extract 6.16 when he elicits energy types.

Extract 6.16. Lesson 20 (Albert)

Line	Speaker	Transcript	IRFEx event
19	T	... can you tell me different kinds of energy? ... kinds of energy ... //types of energy//	I2E Elicits science fact
20	S	nuclear	R1E Short response
21	T	nuclear energy	F1E Accepts answer

22	S	potential energy	R1E Short response
23	S	electric	R1E Short response
24	T	electric energy	F1E Accepts answer
25	S	solar	R1E Short response
26	T	solar	F1E Accepts answer
27	S	chemic energy	R1E Short response
28	T	chemical energy	F4E The 'chemic' sounded like the Catalan '*químic*', so Albert gives students the correct pronunciation
29	S	mechanical energy	R1E Short response
30	T	mechanical energy	F1E Accepts answer

Similarly, Joanna corrects Jordi's use of the past 'dissolved' in extract 6.21 with a quick reformulation of the correct structure. It is surprising that Joanna does not encourage more self-correction during her lessons, as she would have been taught a variety of correction techniques as part of her TEFL training. However, the lessons that feature Joanna were recorded after she had been observing Maria's lessons for 6 months. As a result, she may have been modelling her correction techniques on those employed by Maria.

While Belén offers several corrections in extract 6.6, she rarely corrects students in her four lessons in this study. This could be due to her view that the science is more important than the English and, as a result, does not want to waste valuable time on language points.

There are almost no instances of teachers modelling language for students in the lessons, whether verbally, on the board or on a handout. One example does occur in Albert's lesson 20, where he tells pupils to learn an expression based on the answer 'the more thermal energy molecules have, the more they move' (see extract 6.3). He gives students the example 'the more da ta da.. the more da ta da' as a structure they can use. None of the other teachers uses language modelling as a tool in the transcribed lessons. Given the attitude of Maria, in particular, that the language aspect of CLIL was secondary to the content, this is not very surprising. However, this one instance highlights how neglected the language component was in the lessons in the sample, and how for CLIL to succeed in Catalan classrooms, there should be more focus on integrating content and language, rather than treating the language as merely a vehicle for teaching subject matter.

6.4.4 The Ex-move

In chapter 4, we saw that as many extension questions were asked in Maria's CLIL lessons as in her L1 lessons (table 5.6), which suggests she sought to develop students' understanding and awareness of concepts by going over the same point in detail and asking additional questions. In fact, more of Maria's questions in her CLIL lessons were extension questions (19% of all transcribed discourse) than initiation questions (14%), a similar rate to her L1 lessons (11% initiation/17% extension).

Albert also asks more extension questions (20%) than initiation questions (10%) in his lessons. His motives for doing so are similar to Maria's, as he wants to elicit as much detail as he can on each point. For example, in this extract, we see Albert asking extension questions about what happens to copper sulphate solution when it is heated.

Extract 6.17. Lesson 4 (Albert)

Line	Speaker	Transcript	IRFEx event

Line	Speaker	Transcript	IRFEx event
42	T	so what do you think is happening here? dilitation because the liquid was here and now is here.. so why is bigger here?	I4E Elicits explanation
43	T	((repeats question in Spanish))	I8C Reformulates question in L1
44	S	//because xxxx//	R2C Short response in L1
45	T	yes.. the water here is hot and the water inside the flask is hot. At the beginning was not hot, but after some minutes it hot.. because heat is transferred from the hot water around to the blue solution.. and when the liquid is warm or hot what happens to the particles?	F1E Accepts answer F3E Additional explanation Ex2E Teacher extension question
46	S	faster	R1E Student response

Line	Speaker	Transcript	IRFEx event
47	T	faster yes.. and if they move faster.. the volume gets?	F1E Teacher feedback Ex2E Extension question (elicits fact)
48	S	bigger	R1E Short response

In contrast, Belén asks fewer extension questions (7%) than initiation questions (20.5%). This could be because her lessons often drift into Catalan when the level of complexity increases. In this extract, we see an example of the IRFEx sequence beginning with an initiation question, a student response and a follow up question (lines 9-11). However, students continue to speak in Catalan until Belén gives up trying to use English and lets discourse switch to Catalan for a few minutes.

Extract 6.18. Lesson 18 (Belén)

No.	Speaker	Transcript	IRFEx event

No.	Speaker	Transcript	IRFEx event
9	T	what happen with the temperature? rises or diminishes?	I4E Open question to elicit an explanation I8E Teacher reformulates question and gives students two options to choose from
10	SS	diminishes	R1E Short response
11	T	Ok, in the same proportion or no?	Ex5E Closed question to elicit an explanation
12	S	//no because they are different quantities//	R2C Student response in Catalan
13	T	ok	F1E Accepts answer
14	S	//I think that the temperature will drop because of the xxx//	R2C Long response in L1
		((More student contributions in Catalan. No response from Belén))	

The next IRFEx sequence begins a few minutes later and begins a new topic.

Joanna asks a high proportion of extension questions (20.5%) to initiation questions (9%). Since the format of Joanna's lesson is going over the answers to homework on a handout, most of her extension questions relate to making sure students understand the vocabulary in a question before she asks it. In this case, the prevalence of extension questions does not indicate a high level of depth, but shows Joanna's commitment to making sure students understand the meaning of all the scientific expressions in the text, something she may be doing as a result of her TEFL training.

Extract 6.19. Lesson 7 (Joanna)

No.	Speaker	Transcript	IRFEx event
18	T	when sugar.. what's sugar?	I1E Vocabulary question
19	SS	//sugar//	R1C Short response in Catalan
20	T	sugar good when sugar dissolves in a cup of tea.. can you still taste the sugar or not?	F1E Accepts answer Ex3E Extension question to elicit a fact
21	S	no	R1E Short response in English
22	SS	yes yes yes	R1E Short response in English

No.	Speaker	Transcript	IRFEx event
23	T	It is still there even though you cannot see it.. even though you cannot see it you can still taste it.. when sugar dissolves.. the sugar particles are mixed.. mixed is?	F3E Gives additional explanation in feedback move Ex1E Vocabulary extension question

The extent to which each teacher used extension questions reveals his or her ability to use questions as a teaching tool and their confidence to do so. The fact that Belén asked the fewest extension questions in English, is consistent with her lack of confidence as a CLIL teacher. When students used L1 in Belén's lesson, she quickly joined them speaking Catalan or abandoned the questioning altogether. While in Albert and Maria's lessons, they were largely undeterred by students' insistence on using their L1, and would continue asking questions in a mixture of English and L1 to get as much mileage as possible out of each IRFEx sequence.

6.5 Control of patterns of communication

In Maria's L1 lessons, she often uses pupils' names to nominate them and involve them in the learning process. This is much less evident in her CLIL lessons, and the same is true for the other teachers' CLIL lessons.

Belén nominates pupils by name just three times across her four lessons, and in each case she only succeeds in eliciting one-word answers from pupils, which may explain why she does not employ the technique more often.

Extract 6.20. Lesson 16 (Belén)

86	T	Enrique... the ball is?
87	S	composition number 2

Joanna nominates a lot in her lessons, asking pupils to read text out loud from the worksheet and answer the questions on it. Since Joanna is going over the answers to homework set by Maria, there is little scope to involve pupils in a wider discussion, and pupils are not inclined to ask questions in her lessons. Instead, she uses pupils' names as a classroom management technique to ensure all pupils are involved.

Extract 6.21. Lesson 7 (Joanna)

79	T	what happens when sugar is in a cup of tea? David?
80	S	it dissolved
81	T	it dissolves, good...

Albert, in contrast, very rarely nominates pupils by name, but he controls lessons in a very similar way to Joanna and Belén, asking display questions to which pupils provide short answers. In this way, Joanna's, Belén's and Albert's CLIL lessons are very similar to Maria's CLIL lessons; they are tightly controlled and involve short cycles of IRFEx sequences. This is in contrast to the much more free-flowing L1 lessons taught by Maria, where we see her using certain pupils as 'primary players' (Kasper, 2001) to help explain concepts.

6.6 Discourse markers and modifying speech to learners

Maria involves pupils in her L1 lessons by using discourse markers such as 'algú' (anyone) and 'digues' (tell me) to encourage contributions, but does not use the same technique in her CLIL lesson , instead using 'yes(?)' and 'ok(?)' to break up monologues and check pupils are understanding. The other teachers in the study also use discourse markers in this way. Joanna, as a native speaker, unsurprisingly has the biggest repertoire of discourse markers: 'yeah', 'ok', 'good', 'so'. While Belén and Albert both use 'yes(?)', 'yeah(?)' 'no(?)' and 'ok(?)' to check understanding (when used with intonation) and to break up long explanations with pauses.

The techniques that Maria employs when she modifies her speech to learners include pre-teaching vocabulary, repeating instructions and phrases and simplifying questions by giving pupils a choice of answers. The other teachers in the study also used this range of techniques. For example, Belén pre-teaches vocabulary by showing pupils the items on her desk (can, funnel, plasticine) at the beginning of lesson 19 to help prepare them for the experiment.

Albert's style of speech is very repetitive. In extract 6.22, for example, we can see him saying the keyword 'thermometer' four times in a short space of time, whereas Belén is much more economical with her words and rarely repeats herself (see extract 6.23).

Extract 6.22. Lesson 20 (Albert)

65	T	thermometer... yeah... thermometer.. we will use a thermometer.. when you are ill you use it... no? when you are ill //ill// and if you have to go to the doctor... he will use this thermometer to know if your body is very hot because if your body is more than 37 it means something is going wrong in your body... yeah.. so it's important also to measure the temperature in your body... yeah...

Belén is a lot less repetitive than either Albert or Maria in her instructions, and instead says things once slowly and clearly. As we have already seen, she has less confidence than the other teachers in her pupils' ability to understand her and may have benefited from saying the same thing more than once. In this extract, Belén is telling students how to do the experiment with the tin cans simulating elephants and hippos. Pupils do not have a worksheet in front of them, and Belén does not write anything on the board, although pupils can see the materials for the experiment at the front of the classroom.

Extract 6.23. Lesson 19 (Belén)

6	B	yes... now you begin this activity... you have to look the temperature with the thermometer in the beginning of the experiment.. then you have to wait 5 minutes and look the temperature.. and then at 2 minutes more and er write the temperature.. ok? yes? tomorrow in class.. tomorrow.. no Friday in class we comment the classrooms. yes.. do you understand?
7	SS	yes

The way Belén stacks her instructions here, and tells students that they will go over the results on Friday, would not have helped students understand either.

When Maria gives instructions, she pauses more, to check pupils understanding of vocabulary (see extract 5.27) or draws on the board to explain concepts (see extract 5.12). Moreover, she often repeats the same key words over and over (see extract 5.2).

Maria commented that she sees Belén as a more organised teacher than herself and admires the way Belén is very calm and concise, in comparison to her own tendency to get very excited and talk too much. However, the repetitive nature of Maria's instructions, and particularly the way she uses mime and board work to support them, means pupils are much more likely to understand what she is saying than if they hear things only once, without any visual support or concept checking. Albert is similarly repetitive when he speaks (see extract 6.24) and likes to refer pupils to handouts to make sure they have a written record of what is happening to accompany the spoken instructions.

Extract 6.24. Lesson 4 (Albert)

15	T	ok.. go page 5 page 5.. ok.. this here.. let's read about the experiment you are going to carry out here you find.. thermocline... forget about this.. we have two beakers.. beaker A and beaker B.. which has a higher temperature .. A or B? what are we doing.. we have a dropper with a colour liquid and we drop and let a drop go and in beaker the drop doesn't spread //doesn't spread// the drop that we spread.. and in the beaker from the right side the drop spreads.. we are going to do it now.. here I have beakers here.. I have two beakers and now.. the colour is.. very weak.. and I don't know if you are going to notice it so one here.. and one here.. do you think you can see something? one here and one here?

In this segment, Albert uses the handout, the equipment from the experiment and repetition of keywords such as 'beakers', 'drop' and 'spreads' to aid understanding. Rather than giving instructions for an experiment for students to do, Albert is doing the experiment while he talks to students. However, he goes through the same stages that Maria does. He starts by asking the question that the experiment is designed to answer (which beaker of liquid has a higher temperature?), then he talks through the materials (beaker A and beaker B, the dropper and the colour liquid) and explains the method. As he does the experiment, he gives a running commentary, asking students to comment on what they observe, asking, ‘do you think you can see something?

Tardif (1994) writes about grading language as a modification strategy that teachers can use to help pupils understand them. It is difficult to know how much the Spanish/Catalan-speakers are doing this, since their own level of English means that they speak fairly slowly and forget to use auxiliary verbs when forming questions. However, Joanna, as the only native speaker in the group, sometimes uses Spanish-grammar and intonation rather than questions containing auxiliaries to aid understanding.

Extract 6.25. lesson 7 (Joanna)

65	T	no... a solution is a homo or a heterogenous mixture?
66	S	homogenous

67	T	yes good

6.7 Use of L1 in the CLIL classroom

In this section, I will discuss the use of L1 in the CLIL classes of all the teachers in the study. The use of L1 in the CLIL classroom was an enduring theme of the project. I noticed very early on in my observations that some of the teachers had the habit of repeating questions and explanations in the students' L1. I found this surprising, as I had mostly managed to avoid L1 in the lessons I taught in the initial study, and coming from an ELT background, where L1 in the classroom is largely frowned upon, I viewed it as something to be avoided if possible. At the same time, the teachers frequently told me between lessons and also in their interviews, that they saw L1 as necessary for making sure all the students were able to keep up.

The use of L1 by teachers to ask questions in their CLIL lessons was not very common, with only 13 out of the 165 questions asked in Catalan or Spanish (just under 8%). However, the questions included in the analysis were taken from stretches of intelligible IRFEx sequences conducted in English. There were times in the CLIL lessons when teachers circulated among students participating in experiments or completing worksheets where L1 was used more, and also periods in the class where all participants switched to L1 for a few minutes. Within these periods of L1, IRFEx exchanges predominated, therefore more questions were asked in L1 during CLIL lessons than have been included in the data.

The most common instance of L1 use in the I-move was to translate a question already posed in English (see table 6.8). There is an example of this in extract 5.13 when Maria repeats the question 'how is the water at the beginning of fall?'. Albert also uses this technique in extract 6.15 when he repeats a question word for word in Spanish.

Table 6.8 Reasons for using L1 in the I-move

Lesson number and teacher	**1Maria**	**2Maria**	**3Albert**	**5Joanna**	**6Maria**	**7Joanna**	**15Belén**	**16Belén**	**18Belén**	**19Belén**	**20Albert**
I move											
To repeat a question already asked in English (after failing to elicit a response)			1								
To repeat a question already asked in English (not waiting for a response)		1			7						3
First time question asked							1				

In the interviews, the teachers justified this technique saying that they used L1 when students were not following what was being said. However, the teachers rarely wait after asking a question in English before translating into L1. One student who was interviewed at the end of the course said this technique had made him lazy as he knew a question or an explanation in English would always be followed by one in Catalan so he made less effort to try to understand the English.

One of the most common reasons for students using L1 in the CLIL lessons was to provide an answer to a vocabulary question for example ‘what does ‘the thermocline’ mean?’ (see table 6.9). Teachers almost always accepted an answer in L1 for this type of question and there are very few examples in the data of teachers attempting to elicit an English explanation. This does occur in extract 6.17 (above), when Albert wants to make sure students understand the concept of dilitation, rather than just the translation and succeeds in getting an answer in English.

Table 6.9: Reasons for using L1 in the R-move

Lesson number and teacher	**1Maria**	**2Maria**	**3Albert**	**5Joanna**	**6Maria**	**7Joanna**	**15Belén**	**16Belén**	**18Belén**	**19Belén**	**20Albert**
Responding to a question asked in L1		1	1		6						2
Responding to a question asked in English	1	3	5		4	1	1	3	5		7
Responding to a vocab/concept question	1	3	1	2	5	10	3	2			4
Unsolicited observation/question			3		2	1	2		4		4

More often than not though, an L1 answer is accepted by teachers. For example, in this extract from Joanna's lesson on solids, liquids and gases, she checks students understand the vocabulary at the beginning of class and accepts each translation she is given.

Extract 6.26. Lesson 7 (Joanna)

Line no.	Speaker	Transcript
1	T	ok so let's do it together.. what would taste be? taste Maite?
2	S	//taste//
3	T	yes good.. still?
4	S	//still//
5	T	//still// good.. even though?.. Mario?

Students also tended to make their unsolicited observations and ask questions in L1 rather than English, which would indicate that they did not feel they had the linguistic skills to do so in English.

Students' choice of language depended slightly on the teacher (see table 6.10), though the reasons for this are not obvious as they do not reflect the teachers' choice of language. Students provided the highest rate of English answers in the lessons co-taught by Belén and Jane (81%) and the lowest rate in Joanna's (50%). While Joanna did not use L1 at all to ask questions, she did ask a lot of vocabulary questions and accepted L1 answers to them. Belén and Jane used very little L1 to ask questions (3%) which could help explain why they were able to elicit responses from students in English, however Albert also had a very low percentage of questions asked in English (2%), yet his responses from students were only 60% English, a similar rate to Maria (57%) who asked 15% of her questions in L1.

Table 6.10: Student use of L1 in the R-move

Teacher	Short English answer	Short L1 answer	Short total	% of short answers in English	Long English answer	Long L1 answer	Long total	% of long answers in English	Total answers	% of short answers	% of all answers in English
Maria	25	20	45	56	7	4	11	64	56	80	57
Albert	28	16	44	64	0	3	3	0	47	94	60
Joanna	14	13	27	52	2	1	3	67	30	90	50
Belén/Jane	34	10	44	77	5	5	10	50	54	81	81

Students seemed to use L1 to answer questions when they knew the answer, but did not know how to express themselves in English. Teachers seemed happy to accept their L1 answers and often responded with positive reinforcement in L1, as we see in this extract.

Extract 6.27. Lesson 6 (Maria)

Line no.	Speaker	Transcript
35	T	what happens in summer in the lake?
36	S	//the sun warms the water//
37	T	//very good//

English was used to accept and reject answers in a high proportion of cases (83% to accept and 89% to reject). Additional explanations were mostly provided in English (83%) and where they were given in L1, this tended to follow an explanation in English. Although teachers did not seem to wait to see if students had not understood the English before giving the L1 translation, they generally reverted to English for the next question or set of instructions. We see this in extract 6.7 (above), when Albert accepts an answer in Spanish, translates it into English and then expands on the answer.

A common use of L1 in the F-move was to give encouragement and praise with expressions such as ‘molt bé’ and ‘exacta’, particularly when the answer was given in L1, as we saw in extract 6.27 (above). In table 6.11, we can see the extent to which teachers maintained English in the F-move, and in table 6.12, we can see why they used it.

Table 6.11: Use of L1 in F-move

			% in English			% in English			% in English
	Accepts answer in English	Accepts answer in L1		Rejects answer in English	Rejects answer in L1		Additional explanation in English	Additional explanation in L1	
CLIL Lessons									

			% in English			% in English			% in English
	101	20	83%	8	1	89%	43	9	83%
Maria	27	13	68%	1	1	50%	15	8	65%
Albert	20	6	77%	2	0	100%	11	1	92%
Joanna	20	1	95%	2	0	100%	11	0	100%
Belén	6	0	100%	1	0	100%	4	0	100%
Jane	28	0	100%	2	0	100%	2	0	100%

Table 6.12: Reasons for using L1 in the F-move

Lesson number and teacher	**1Maria**	**2Maria**	**3Albert**	**5Joanna**	**6Maria**	**7Joanna**	**15Belén**	**16Belén**	**18Belén**	**19Belén**	**20Albert**
Evaluation of an answer given in L1	1	2			9						4
Evaluation of an answer given in English					1						
Providing additional explanation following on from English explanation		2	2		3						
Providing explanation (not already given in English)			1		3						
Responding to a student question/observation in L1					2		2				1
Asks if ss understand					1						

Despite the teachers' protestations about the importance of using L1 in the classroom, I continued to see it as a negative aspect of the lessons I observed throughout the project and tried to make helpful suggestions on how to avoid using it, for example, by pre-teaching vocabulary at the beginning of each lesson or putting useful language on the board. The teachers ignored my well-intentioned advice, however, and the use of L1 in

Maria’s lessons increased rather than decreased as the academic year continued, with a higher incidence of L1 in lesson 6 than in either lesson 1 or 2 (see tables 6.8 and 6.9).

6.8 Classroom observation

Like Maria, both teachers used pointing and mime to explain concepts. Belén’s lessons followed a similar format to Maria’s, with a series of practical activities interspersed with whole class discussion and activities on a handout. Belén elicited the materials to be used in a task by holding them up and asking students for the English vocabulary. She also mimed some of the instructions so students could see what they had to do.

Albert used a similar technique, for example, pointing to his eye to describe dilatation as we see in this extract from lesson 20.

Extract 6.28. Lesson 20 (Albert)

43	T	For example.. you know this small thing in your eye ((points to his eye)).. black ((students nod and make sounds to show understanding)).. it is also dilatation yeah.. it grows when it’s dark.. it becomes bigger and when you have a lot of light it becomes smaller

While the level of challenge appeared to be higher in Albert’s lessons than in Belén’s lessons, I noticed that student involvement was higher in Belén’s classroom. This was because students were constantly involved in an activity, either filling containers with water and measuring the temperature, or completing a worksheet. Albert’s lessons had a similar format to Maria’s L1 lessons with a high degree of IRFEx sequences, and while students mostly appeared attentive, it was always the same handful of students answering and asking questions. Therefore, the rest of the class may not have been actively listening, and were certainly not as actively involved as they were in either Maria’s or Belen’s CLIL lessons where they were kept busy by the task at hand.

6.9. Curriculum/task (content) analysis

In table 6.13, I present the results of the checklist used to assess whether the key features of CLIL were present in the lessons of all three teachers in the study.

Table 6.13 Content analysis of Maria's and the other teachers' CLIL lessons

	Lesson 1 (Maria)	Lesson 2 (Maria)	Lesson 16 (Belén)	Lesson 19 (Belén)	Lesson 4 (Albert)	Lesson 20 (Albert)
Cognitive challenge	low	low	low	low	medium	medium
Difficulty of content	low	low	low	low	medium	medium
Opportunities for communication (groups)	y	y	y	y	y	y
Opportunities for communication (whole class)	y	y	y	y	y	y
Cultural aspect	n	n	n	n	n	n
Interactive materials	y	y	y	y	y	y
Multi-modal input	y	y	y	y	y	y
Task-based learning	y	y	y	y	y	y

The level of cognitive challenge was higher and the difficulty of content greater in Albert's CLIL lessons than in either Belén's or Maria's. It was not as high as in Maria's L1 lessons, but the format was similar in terms of the questioning style and the way experiments were conducted in front of the class. Albert was also successful in getting students to contribute to learning, for example, by eliciting what molecules are as we see in extract 6.29 below.

Extract 6.29. Lesson 20 (Albert)

LIne	Speaker	Transcript
141	T	… do you remember what a molecule is? the definition.. in Catalan or Spanish… do you remember it?
142	S	molecula?
143	T	yes… molecula.. what is a molecule made of? //what are molecules made of//
144	SS	atomos

145	T	atoms yeah.. and these molecules are still like this? ((mimes standing still)) *quietos* //still//?
146	SS	no
147	T	no.. they are moving.. yeah

While Albert is still having to work hard to get students to contribute, through the use of mime, L1 and reformulated questions, he is able to get more examples of scientific knowledge out of students than Maria or Belén were able to in their CLIL lessons. This is partly due to the higher English proficiency of his students, some of whom had a B2 level, and also because of his decision to conduct experiments himself, which was less time consuming than setting them up as a task for students. This, however, was at the expense of the level of interactivity of his materials, which were mostly in the form of handouts.

Belén's lessons, like Maria's CLIL lessons, did not explore the science at a high theoretical level. However, the materials were very interactive. In lesson 19, students had to set up test tubes containing hot water in different formations and measure the temperature with the aim of discovering the best formation for conserving heat. The activity was designed to simulate penguins huddling together to keep warm. While the level of challenge was quite low, the task kept students occupied and engaged and gave them the chance to make accurate observations, work with peers and arrive at and identify facts (Watson, 2000).

None of the teachers was able to get the students to use English when communicating in small groups without the intervention of a teacher. Belen had asked students to share the results of the temperatures in the test tubes in English, which was well within their capability, but they continued to talk about them in Catalan unless called on by either Belén or myself.

As in Maria's CLIL lessons, there was no cultural component to Belén's or Albert's CLIL lessons. However, using the examples of real animals (hippos, elephants and penguins) in Belén's lesson 19 with models to represent them seemed to add to the level of interest and engagement of students.

6.10 Conclusion

This chapter has looked at the other teachers' CLIL lessons using SETT and IRFEx moves as frameworks for analysis, alongside classroom observation and curriculum/task (content) analysis. What emerges from this research are clear similarities in teaching style and techniques between the four CLIL teachers, particularly when we compare these lessons to the L1 lessons in the study. These similarities are most pronounced when we look at the IRFEx patterns and question types used by teachers. Moreover, the CLIL lessons share a varied lesson structure and (unfortunately) quite low rates of student talk. This is in contrast to Maria's L1 lessons which seem more fast-paced and fluid, and have a greater level of student involvement.

Considering these similarities, and bearing in mind that Albert does not know the other teachers, then it appears that these lessons do form a representative sample of CLIL science lessons in secondary schools in Catalonia and share several features.

These features, in summary, are:

- Mostly low levels of English among students (usually A1 or A2). This means that pupils lack the confidence to ask questions or provide answers of more than a few words. This problem is exacerbated by the questioning style of teachers, which leads them to produce short answers.

- A multi-modal approach to teaching, which features experiments, worksheets, videos, etc. in addition to IRFEx sequences of dialogue. This results in a reduced pace of lesson since the same point is taught repeatedly in a number of ways. However, it does mean that the content is taught more thoroughly than it is in the L1 lessons.

- A focus on asking questions that check understanding of vocabulary and scientific facts.

- A high incidence of display over referential questions.

- Indirect repair of scientific knowledge and direct repair of language mistakes.

- More tightly managed lessons. The teachers use managerial mode to tell students what they are going to learn, remind them to make notes on what they are learning and then round up to make sure they know what they have been learning.

Chapter 7. Results and discussion: student and teacher views

7.1 Teacher views 2009

In June 2009, I interviewed Maria, Belén and Albert about their individual experience of teaching CLIL during the academic year. Joanna had already left La Garriga and was not available for interview. Maria and Belén were interviewed together, and Albert was interviewed separately.

On transcription, a number of common themes emerged in the interviews, and the teachers agreed on the importance of several points, which form the headers for this section. For example, they all commented on the difficulty of using English as the only language of instruction in class and the problems they had getting pupils to speak English in class. Furthermore, they all talked about the benefits of an interactive learning experience and the need for well-designed materials to support learning. They also told me how tired they all felt after an academic year of trying to use English to teach science.

Use of English, Catalan and Spanish

All of the teachers mixed English with either Catalan or Spanish in their lessons. As we saw in chapters 5 and 6, their use of L1 in the class varied, but each teacher used it to some extent. Their reasons for this differed. Albert said that adhering to English was hard, as he did not know all of the technical language. Belén said she found it difficult to speak entirely in English, because her level was not sufficiently high. She found it frustrating that she only had one way of saying things in English, since if a pupil did not understand something in a science lesson taught in Catalan, she could keep rephrasing her point and choose new ways to say the same thing until they understood. In her interview, she said, 'But if I say all time the same vocabulary... the same sentence... I think the problem of the pupils is the same... they don't advance'.

Belén's insecurities about her English level meant she put a lot of pressure on herself to learn all the technical words beforehand, something that neither Albert nor Maria were concerned about.

In this interview extract, we can see the contrast between Mara and Belén on this issue.

Extract 7.1

> Maria: I think that I am confident with English even though I have problems sometimes, but I don't know... I think, I don't know this word, so I look for it in the dictionary or the Internet or whatever, but she...
>
> Belén: I think I have to know all the vocabulary, I have to know all the structures, I have to know... for me

Out of all the teachers, Belén was the only one who felt that she should be speaking in English 100% of the time, but because of the pupils' lack of English, she always switched to Catalan by the end of the class. She justified this transition to Catalan, by saying it was necessary to achieve the learning outcomes of the lesson. 'Normally I finished to speak in Catalan because I think it is very important that the pupils learn science. If they learn English too better. But the first thing that I have to do is learn ((teach them)) science.'

Albert also thought pupils found it helpful when he spoke in English and then repeated what he had said in Spanish, so he often switched to Spanish to make sure everyone had understood.

Extract 7.2

> Jane: Did you sometimes switch to Spanish because you couldn't find the English or did you always do that just to help them understand?
>
> Albert: Or because I want to be completely sure that they understanding this concept. You see I have to read their faces. So if I can see from their faces that I have something... because I also I don't have a exact idea of which expressions which tenses for example modal verbs... I don't know to what extent they know them. I should ask the English teacher what they are working with. Sometimes I use expressions like conditionals or something but maybe they haven't learned.

However, Albert did concede that he should not do this, and instead find ways to make everyone understand in English using other strategies.

Extract 7.3

> Jane: Do you think the students found it helpful when you spoke in English for a minute and then you repeated the instructions in Spanish?
>
> Albert: Yes helpful. but we shouldn't do this. If we are reading they have to underline which words they don't understand and they I try to explain it in English or something.

Maria did not see a methodological or pedagogical reason to use English all of the time and thought using Catalan from time to time was useful for pupils. Like Belén, her priority was that pupils learnt the science, rather than improved their English, and she thought that if she did not use Catalan, the pupils would not have been able to follow the class. In fact, Maria said that when she was studying in Nottingham, John Clegg, an EAL/CLIL consultant, had told her not to be afraid to use L1. She said that he had suggested she first let pupils speak in their L1. After this, they could write their ideas down in English and finally, they could participate in a plenary session in English and share their ideas. This reflects also the view of South (1999).

Difficulty of getting students to use English in class

Maria and Belén were particularly concerned that pupils were much quieter in the CLIL lessons and did not ask any questions in the English environment, either in English or in Catalan. This is something that is reflected in the transcripts of all of the CLIL lessons, while in Maria's lessons in Catalan, there is a higher level of student participation (see table 5.6 in chapter 5). All of the teachers recognised that it was a problem that they wanted to resolve, but they did not have concrete ideas about how to encourage student participation.

As I mentioned earlier, Maria was eager to use L1 to give pupils the chance to clarify their ideas. When I suggested speaking frames or pre-teaching phrases to give pupils more tools to speak, she was dismissive of ELT-type methods, saying she wanted pupils to speak naturally. 'We would like them to speak in a natural way. I told you, I don't want this artificial things'.

Importance of interactive activities and experiments

All of the teachers agreed that activities with a lot of interaction and visuals had worked very well in the CLIL lessons, since pupils seemed to enjoy them. Albert's pupils usually did not do experiments themselves, and instead watched Albert doing them. However, his lessons often included group activities, where pupils had to share information and work together. These, he thought, had worked the best, along with those where pupils had to get out of their chairs and move around. Maria and Belén both agreed that the most successful lessons, in terms of pupil engagement, had been those with practical activities, such as the hippos and penguins experiment to see how heat is retained. As I have already mentioned, Maria, in particular, was very resistant to ELT-style activities, and said that John Clegg had also given her the advice to be natural and not fill her lesson with activities she did not feel comfortable using. She cited dictogloss, crosswords and games as examples of activities she had been recommended to use as part of her CLIL training, but was unwilling to incorporate into her repertoire of tasks.

Feeling jaded and tired after a year of CLIL

Albert had been part of a team of teachers in his school that had taught some of their lessons in English during the academic year of 2007-8. Albert was not going to continue at the same school the following year, since he only had a one-year placement there, but he thought that the other teachers would not continue with CLIL either, because it entailed too much work and extra meetings. He identified a problem that he thought was common to a lot of schools in Catalonia. He thought older teachers, who were stable in their school (with a fixed term contract), lacked the energy, enthusiasm and English levels to set up CLIL programmes. On the other hand, younger teachers, who did have the energy, enthusiasm and English levels, did not have long-term contracts in their schools and had to move every year or two. This instability in their position meant that they were less likely to establish CLIL programmes. As I mentioned in my literature review, despite government support for CLIL, the impetus for CLIL projects in Catalonia has to start at grass roots level, and usually begins with a teacher, like Maria, who has a good level of English and the enthusiasm to put in the extra effort to create and teach CLIL lessons.

By the time of her interview, Belén had decided she was not going to teach CLIL the following year. She said she had been too tired to teach the last few lessons in English, even though the materials had already been prepared. Reflecting on what she considered to be her failings in English, she said she would spend more time learning English, ‘perhaps two, four, six or seven years’ and then, when her level was higher, she would try again.

Even Maria had waning enthusiasm. When she first got back from her 3-month course in Nottingham, she said she had done everything in English. The academic year 2008-9, she had taught CLIL 50% of the time, and by 2012, she was only teaching the occasional lesson in English with her *Bachillerato* students (16-18-year olds).

Planning and materials

All of the teachers agreed that their lessons would have been more successful if they had had access to better materials. Albert said that if he did the course again, he would produce a dossier for the whole year to be used regularly, rather than giving pupils one-off worksheets in individual lessons.

Maria had developed all the materials herself for the course, and thought that she needed more time to develop them. She thought that with experience, she and Belén would get used to teaching with the new materials and would use them more effectively. She thought she could use the two units she had developed that year and build up resources, so they would do a few things well, rather than continue with their ad hoc approach to CLIL, which had characterised the academic year 2008-2009. Maria added that they could not just do what they do in Catalan. ‘We can’t only translate what we do in Catalan. We have to understand and give support and scaffolding.’

Teach whole units in English

None of the teachers taught the whole year of 2nd of ESO science in English. Albert did three units entirely in English, choosing what he considered to be the easier ones that did not contain too much maths. Maria had mixed up the course and sometimes taught a whole unit in English, and other times taught a unit in a combination of English and Catalan, for example, doing the theoretical lessons with the larger group in Catalan and the practical activities in English with the smaller group, when it was split into two. By the end of the course, she was of the view that it was better to do whole units in English. She thought the heat unit had worked well as the whole dossier and all the activities were in English, so when pupils did the experiments in English, they understood the background information. In other units, where pupils did most of the work in Catalan and then one isolated experiment in English, the pupils had not understood what they were doing in the experiment. This had happened in an experiment the previous day to the interview. Maria said, ‘yesterday, the problem with icebergs was the students don’t know what they are doing. They are putting something in the fridge or using a sensor and they don’t know why they are doing it’.

CLIL for everyone?

One area where the teachers varied in opinion was whether CLIL was for all pupils, regardless of their background and abilities.

In Albert’s school in El Raval, pupils were streamed. He told me that pupils who were recent arrivals to Spain and were having problems learning Catalan and Spanish and integrating into the school had a different curriculum to other students. The pupils in his CLIL lessons, on the other hand, were the most able and had been selected on the basis of being responsible and hard working. Not all of the pupils in Albert's CLIL group had a high level of English, and levels ranged from A1 to B2. Albert thought CLIL worked well for people who were already good at English, but for students who struggled with language learning, it made them think the subject was even more difficult and had a negative effect on their self-esteem.

Albert had not received very much CLIL training, and as a result, his lessons were quite improvised. Sometimes, he scaffolded learning, by checking comprehension and pre-teaching vocabulary, which pupils recorded in a vocabulary notebook. However, other times, his CLIL lessons resembled Maria's L1 lessons in format, and were characterised by IRFEx sequences. These worked well with the pupils who had the higher levels of English, but he was aware that the pupils with lower levels of English were not following the discussion. Despite Albert’s assertion that CLIL was not for everyone, he thought that even the pupils who had found it difficult admitted it was good for them and had helped their English.

Maria and Belén were both completely opposed to streaming and, unlike Albert, they believed that CLIL was for everyone, and in some cases particularly helped pupils who were not usually very good at English or science. This may have been helped by the more even spread of English levels among their students, since no pupil had a level higher than B1. Both teachers mentioned students by name who usually did not do well in science, but had learnt a lot that year in the CLIL lessons. In particularly, Maria thought the three boys with learning difficulties in her group, who always had a teaching assistant with them, had got a lot out of the English classes with experiments, as there was so much to see and do. All of the pupils had passed the end of course exam as well, but the teachers admitted in the interview that the exams were designed so that everyone could pass them, and that they used extension questions to stretch the more able students. They also thought that because a few points were taught so repetitively, every student was able to remember some key concepts from the lesson.

Extract 7.4

> Maria: ‘Through! They will remember all their lives “through”’
>
> Jane: It’s their new word
>
> Maria: I don’t know if it’s important or not.
>
> Jane: But we taught them
>
> Maria: Then the thing of more than, the particles move, less than, this thing of compare things. I think it was good this.

Maria and Belén thought their students could be divided into three groups: those with a good level who enjoyed the classes, those who were afraid to try, and those who did not have a good level, but tried anyway.

Extract 7.5

> Maria: I think that the ones that have a good level of English responded and then the ones that are curious about that they know and there are people that are afraid and even if they are good students, they are afraid. But others are bold like this xx that you said and they find it nice to say it in English and they try to say it in English.

Within the middle group, Belén said that some pupils always responded with surprise when they found out a lesson was going to be in English and would say, ‘in English?’ in horror at the idea.

7.2 Teacher views 2012

In June 2012, I went back to the school in La Garriga to talk to Maria about how her CLIL project was going. Before our meeting, I sent her my first results and discussion chapter to read, in which I compared her CLIL lessons with her L1 lessons.

In response to my chapter, Maria said she had felt very flattered by reading it, and it was like getting a portrait painted of her, in that it highlighted a lot of things she already knew about herself, but brought other things to her attention, both positive and negative, that she had previously been unaware of. She agreed with my point that while the L1 lessons had been more dialogic than the CLIL lessons, only a few pupils had really contributed to the dialogue. She also agreed that the CLIL lessons had been more interactive and inclusive in that every pupil had been involved in the learning experience.

In terms of her commitment to CLIL, Maria had significantly scaled back on the amount of time she spent teaching in English. She made the observation that pupils now joining the school at the age of 11 had higher English levels than in previous years. This, we speculated, was a result of the earlier starting age for learning English (of 3-years rather than 6-years old) and also a general improvement in the level of English teaching in school, now that all new teachers were required to do a one-year PGCE-type course with teaching practice, rather than sit a civil servants examination.

Despite this, Maria felt she had lost the momentum to teach in English, and very rarely used it with her ESO pupils. She occasionally used English with her 2nd of *bachillerato* students in English, since these were the students who she had taught in English when they were in 2nd of ESO (the group in this study). With these pupils, she would teach a unit in Catalan, then revise the main points in English using powerpoint to present the key language. This was followed up with a plenary-style session, using the target language on a powerpoint slide to support learners.

Maria thought part of the reason why she was not teaching in English was because she found it more difficult than teaching in Catalan and had never been able to get pupils to contribute in English in her classes. She reiterated the importance of science over English in this interview, saying that the science aims were 100% and English 0%. She pointed out that students sit 6 exams a year, which makes them very anxious about learning. Maria was of the view that 6 exams per academic year was excessive but appreciated this was a school policy. As a result, getting pupils to understand the science had become her main focus.

7.3 Student views 2009

All of Maria's and Albert's 2nd of ESO pupils who attended school on the relevant days participated in interviews held in focus groups of between 4 and 7 pupils. I did not conduct interviews with Belén's group. I also collected questionnaires from 11 of Maria's pupils and 19 of Albert's.

The school in El Raval was unusual in terms of its high proportion of pupils who spoke a language at home other than Spanish or Catalan. Albert and I had both observed that pupils who had learnt Spanish and Catalan as a second language, were finding it easier to adapt to the CLIL lessons. As a result, a question about pupils' home language was included on the questionnaire to find out if pupils with different linguistic backgrounds had experienced the CLIL lessons differently. The results are presented in table 7.1 below.

Table 7.1 Results of questionnaire with El Raval and La Garriga pupils June 2009

Students were asked to mark the following statements on scale of 1-5

Agree = estoy de acuerdo

Disagree = no estoy de acuerdo

1. Strongly disagree

2. Disagree

3. Neither agree nor disagree

4. Agree

5. Strongly agree

SS	Lang.	1: I can now understand more English that I did at the beginning of the year	2: Science is a difficult subject for me (in Catalan or English)	3: It was more difficult to study science in English than in Catalan	4: Science in English is more interesting than learning English as a subject	5: It is easier to understand science in English when the teacher also speaks in Catalan	6: Doing experiments in science class helps me understand	7: I want to study other subjects in English, for example History	8: I ask more questions in class when the teacher speaks in Catalan
GS1	Catalan	4	3	2	3	3	5	2	2
GS2	Catalan	3	2	4	3	4	4	1	3
GS3	Catalan	4	4	5	2	4	5	1	4
GS4	Catalan/ Spanish	4	2	3	2	5	5	1	3
GS5	Catalan	yes	no	no	yes	yes	x	Yes, history	yes
GS6	Spanish	5	2	3	2	2	4	5	3
GS7	Catalan	4	2	4	2	4	5	2	3
GS8	Catalan	2	3	5	2	4	5	2	5
GS9	Catalan/ German	4	2	1	5	2	5	1	1
RS1	Spanish	2	5	5	3	5	4	3	2
RS2	Ilocano/Spanish	5	4	1	3	1	5	3	3
RS3	Spanish	2	5	4	1	5	5	1	3
RS4	Spanish	2	3	5	3	4	5	1	3

SS	Lang.	1: I can now understand more English that I did at the beginning of the year	2: Science is a difficult subject for me (in Catalan or English)	3: It was more difficult to study science in English than in Catalan	4: Science in English is more interesting than learning English as a subject	5: It is easier to understand science in English when the teacher also speaks in Catalan	6: Doing experiments in science class helps me understand	7: I want to study other subjects in English, for example History	8: I ask more questions in class when the teacher speaks in Catalan
RS5	Tagalog, English and Spanish	5	3	1	5	4	5	5	3
RS6	Spanish	3	3	2	4	4	5	3	3
RS7	Spanish	5	2	5	2	5	4	1	5
RS8	Bangali, Spanish	4	4	3	3	4	5	2	3
RS9	Chinese and sometimes Spanish	5	1	4	3	5	4.5	1	5
RS10	Bulgarian		4	3	1	3	3	4	1
RS11	Tagalog, Spanish	4	2	2	5	3	4	4	3
RS12	Spanish	4	3	5	4	5	4	1	4
RS13	Tagalog	5	4	1	1	3	4	5	2
RS14	Spanish	4	1	3	4	3	5	3	3
RS15	Spanish	4	5	5	2	2	3	1	3

SS	Lang.	1: I can now understand more English that I did at the beginning of the year	2: Science is a difficult subject for me (in Catalan or English)	3: It was more difficult to study science in English than in Catalan	4: Science in English is more interesting than learning English as a subject	5: It is easier to understand science in English when the teacher also speaks in Catalan	6: Doing experiments in science class helps me understand	7: I want to study other subjects in English, for example History	8: I ask more questions in class when the teacher speaks in Catalan
RS16	Catalan/ Spanish	2	3	3	4	3	5	2	3
RS17	Spanish	3	4	3	2	5	3	2	4
RS18	Spanish	4	1	1	3	4	5	4	1
RS19	Arabic and Spanish	4	2	5	2	4	5	2	4

GS: Student in La Garriga

RS: Student in El Raval

Questionnaire results

As Albert and I had thought, the pupils who spoke a language other than Spanish or Catalan at home had the most positive view of the CLIL lessons. 100% of this group agreed that they could now understand more English than at the beginning of the year, compared to 69% of the total.

Most of the non-Spanish/Catalan speakers were not born in Spain, and had moved there in recent years. As a result, most of their schooling would have been as immersion learners, studying content subjects in a language they did not speak at home. CLIL for them, would have been the norm, rather than the exception, which may explain their overwhelming acceptance of it. The Spanish and Catalan speakers in El Raval were the group least convinced that the CLIL lessons had helped their understanding of English, and only 45% agreed. On a similar note, 44% of all students agreed that it was more difficult to study science in English than in Catalan, but this figure drops to 25% among bilingual students and rises to 53% among Catalan and Spanish speakers.

The teachers' view that speaking Catalan or Spanish in class was helpful for pupils was supported by 68% of Spanish and Catalan speakers, who said they found it easier to understand science in English when the teacher also spoke in their L1. However, only 50% of non-Spanish/Catalan speakers agreed. Some of these pupils told me in their interviews that they understood English better than Spanish, so when Albert switched to Spanish they found it more confusing than when he spoke in English all of the time.

All of the pupils agreed that doing experiments in class helped them to understand. 100% of students in La Garriga thought this, perhaps because they conducted the experiments themselves. However, in El Raval this figure was also high at 84%. The majority of Spanish and Catalan speakers (74%) said that they did not find science a difficult subject (either in Spanish or in English). However this figure is much lower for pupils from other linguistic backgrounds, of whom 50% said they found it difficult.

Despite the general agreement that their English had improved as a result of the experience, few wanted to repeat the process the following year with another subject. Only 11% of Spanish and Catalan speakers wanted to study another subject in English, though this figure was 50% among bilingual students. This is reflected in the low percentage of students who thought science in English was more interesting than learning English as a subject, with only 13% of La Garriga students thinking this was the case and 32% in El Raval.

All of the 28 students who completed the questionnaire answered the final open question, 'what is your opinion of studying a subject like science in English?'. They were invited to answer in English, Spanish or Catalan and, of the total, 13 (46%) answered in English, 5 (18%) answered in Catalan and 8 (29%) answered in Spanish. All students took this as an opportunity to give their opinion in reference to their own experience on the course. Despite student comments that they would not like to repeat the experience, 16 (57%) were very clearly in favour of learning content subjects in English.   Several students said they liked how they had studied 2 subjects at the same time and thought it had improved their English. One pupil commented, ‘studying the subject in English we learn new vocabulary and it prepares to the future’. All but 1 of the students in La Garriga wrote positive comments about studying subjects in English, as did 6 out of 8 of the pupils from other linguistic backgrounds (75%) in both schools.

4 students (14%) from both schools had a mixed reaction to the methodology and made comments such ‘It was good, but at times quite complicated’. One of these student wrote in Catalan ‘//The people that don’t know English found it harder to ask and answer questions in English//’.

7 students of the total (25%) wrote that they did not enjoy the experience at all. All of these respondents were in El Raval and included 6 out of the 11 Spanish and Catalan speakers (55%). One student wrote in Spanish, ‘//The classes in English are very difficult for me. I don’t understand anything and I get bored and irritated//’. Another student wrote, ‘//The truth is that physics and chemistry are difficult and if we have to do them in another language it is more complicated.//’

Perhaps unsurprisingly, of the 7 students who wrote a negative comment, 6 (86%) chose to write the comments in Spanish or Catalan, compared with only 4 out of the 16 (25%) who wrote about having a positive experience. In conclusion, the students who found English difficult and lacked confidence in their productive skills were those who least enjoyed the course.

Interviews

Learning experience

Several pupils, across both schools, thought that the CLIL science lessons were more 'interesting and fun' than the L1 lessons, and most agreed that they had benefited from doing experiments in class. In the questionnaires, all of the La Garriga pupils and 84% of the El Raval pupils thought doing experiments in class had helped them to understand. This supports the view that experiments are a valuable element of science teaching (e.g. Tobin, 1990).

When asked about their favourite lessons in the interviews, all of the pupils cited a class that had involved a practical activity. One of the pupils in La Garriga, spoke animatedly about the geyser experiment he enjoyed, demonstrating how much vocabulary he had learned in the process.

Extract 7.6 (La Garriga)

> Jane: ...which were the best classes this year in science? I saw the class with the penguin, with the test tubes, with the icebergs. Do you remember which was your favourite class in science?
>
> S1: Geyser class
>
> Jane: Geyser class?
>
> S1: You had a bowl a pot where you put water then you put a tap ((a top)) then float and you put cotton and then you burn it and you...

As we saw in the transcripts, the CLIL lessons were much more multi-modal than the L1 lessons and featured a greater range of task-types. From the questionnaires and interviews, it appears that pupils preferred this style of learning. This multi-modal teaching-style emerged in this context because the language of instruction was English, and teachers needed to abandon their usual transmission-style lessons in order to get their teaching aims across to students. It is likely, however, that pupils would have been equally happy for their L1 lessons to contain this level of interactivity and task-based learning, as they would for it to have taken place through the medium of CLIL.

A common theme that emerges from the questionnaires and interviews is that students felt they were learning more as they were studying two subjects in the time it usually took to study one (see extract 7.7 below - about learning vocabulary). This is something that proponents of CLIL in plurilingual settings hoped would occur to ease pressures on school timetables that had to accommodate two official languages plus a foreign language (Marsh, 2002). However, some pupils commented that the lessons in English were slower than those taught in Catalan.

Extract 7.7 (La Garriga)

Jane: This year you studied lots of science in English. Did you learn more because it was in English, or the same or maybe less?

SS: The same. si

Jane: You think completely the same?

SS: Yes

S1: Slower to classes

This corresponds with the teachers' concerns about a slower pace of learning, and this slow pace is also evident in the transcripts, which show a very repetitive lesson structure with pupils doing 4 or 5 tasks over an hour to learn just 1 main learning outcome, for example, that metal expands when you heat it.

Of the positive comments, several students said they thought it had improved their English. One student said, 'Studying the subject in English, we learn new vocabulary and it prepares to the future', showing his or her awareness that a good knowledge of English is essential to get access to university and a good career. Pupils cited a range of skills that they thought had improved as a result of the CLIL lessons, and most agreed that their vocabulary was better than before.

Extract 7.8 (La Garriga)

Jane: So what did you think about your experience this year.. about studying science in English?

S1: It was good

Jane: Yeah, why did you like it?

S1: Because we practised English..we learned words in English like thermo.. themom..

Jane: Yeah themometer.

Others thought their listening and writing had improved, saying that having Joanna and I in class had helped their listening skills, in particular. However, some pupils thought their speaking levels had not improved, since there were not many opportunities to speak in the CLIL lessons. One pupil in La Garriga commented that they spoke more in the *extraescolar* (after school) English lessons because they had a native English teacher.

Extract 7.9 (La Garriga)

Jane: Is your English better now?

S1: listening yes, speaking no

S2: We listen you and Joanna

Jane: But you don't speak much in class

SS: no

S3: *extraescolar* (after school classes) better

Jane: Do you speak a lot (in after school classes)?

S3: yes, because the teacher is English.

This opinion is consistent with Maria and Belén's view about low student talk, and it is also reflected in the results of the IRFEx analysis (see chapter 4.1). The teachers think the low level of student participation is due to the low level of English among learners. However, there were very few activities, where pupils were given the tools they needed to communicate with each other. In the *extraescolar* classes, the teacher would have used communicative methods and materials designed to get pupils speaking, regardless of their level.

As we saw earlier in this chapter, Belén and Maria felt that CLIL was for everyone, regardless of their level. However, Albert thought it suited pupils with more ability and a higher level of English. Students from both schools agreed more with Albert on this point, and the pupils who chose to use Spanish or Catalan in their questionnaire or interview, reflecting either an inability or reluctance to use English, were particularly negative about CLIL. A typical comment was that, '//The people that don't know English found it harder to ask and answer questions in English//'. Several pupils in their interviews admitted to only understanding about 50% of what the teacher said.

Extract 7.10 (La Garriga)

> Jane: What did you think?
>
> S2: Difficult
>
> Jane: Why?
>
> S2: porque me cuesta por entenderlo //because I find it difficult to understand//
>
> Jane: All right. Did you understand Maria when she spoke in English? or only sometimes?
>
> S2: sometimes.

In the same interview, another pupil with a higher level of English commented that he thought CLIL was 'strange' and for a 'higher level'.

Another student, this time in El Raval, wrote in Spanish, '//The classes in English are very difficult for me. I don't understand anything and I get bored and irritated//'. Another wrote, '//The truth is that physics and chemistry are difficult and if we have to do them in another language it is more complicated.//'

Use of L1

Despite all of the teachers believing it was necessary to use the pupils' L1 from time to time, not all of the pupils agreed. One pupil from Maria's group in La Garriga pointed out that using Catalan made pupils lazy, as they knew they did not have to pay attention in English.

Extract 7.11 (La Garriga)

> Jane: Did you like it when Maria first of all speaks in English and then she repeats in Catalan. Was that a good idea? Did it make a difference?
>
> Alex: I think it's a bad idea to repeat in Catalan because more people don't listen in English and they listen in Catalan.

After Alex made this comment, a number of pupils agreed that they quite often stopped listening when the teacher spoke in English, as they knew they would have the content repeated to them in Catalan a few minutes later.

Extract 7.12 (La Garriga)

> Jane: In class, Juan, did you listen to the English with Maria, or not really
>
> Juan: fifty fifty
>
> Jane: Ok, what about you, Miquel, when Maria was speaking in English did you listen? Or did you think .. ah .. not necessary?
>
> Miquel: Yes
>
> Jane: What about you two?
>
> Carolina: Listen in Catalan
>
> Jane: Just to the Catalan. And what about you, Sandra?
>
> Sandra: English and Catalan

Some pupils thought that combining English and Catalan or Spanish within the same lesson made the lessons more confusing, but liked the idea of repeating some of the content that had been taught in English in L1 to give everyone the opportunity to catch up and check that they had understood.

Extract 7.13 (El Raval)

> Jane: Do you like it when you do one hour completely in English and one hour in Catalan?
>
> S1: No mixed
>
> S2: Mixed no
>
> S1: one class English one class Catalan

Jane: So the same class in English and then in Catalan

S1: Just what you don’t understand

However, some pupils liked a combination of the two languages, saying it gave them the chance to know what a word meant, because they heard the L1 word straight after the English one. Moreover, a pupil in Raval said it gave them 'more opportunities to understand’.

Despite the general agreement that their English had improved as a result of the experience, few wanted to repeat the process the following year with another subject. This is quite a similar reaction to that of the teachers. In the questionnaires, only 23% of pupils wanted to study a subject in CLIL the following year. Although, as we saw earlier, this figure changes depending on pupils' native language. Like the teachers who were feeling tired about a year of teaching CLIL, it is likely that the pupils, who were being interviewed in June at the end of the academic year, were also feeling tired and, despite conceding that it had been a useful experience, would rather not go through it again.

Extract 7.14 (La Garriga)

Jane: Next year, do you want to study more subjects in English?

All: no

Jane: Imagine you have the opportunity to study history

All: no no no

Jane: So, do you prefer to separate English as a subject and subjects in Catalan.. subjects in your language.. and English is just English. Does everyone agree? Alfonso?

S1 (not Alfonso): but science, si ((yes))

Jane: Ok, but why science?

S1: Because we did it and because of the teacher

Lower student participation

Pupils agreed with Belén and Maria that they had participated less in the CLIL lessons, something that is also reflected in the transcripts. As we can see from the extracts below, pupils placed the blame squarely on the difficulty of using English in class.

Extract 7.15 (La Garriga)

> Jane: In the Catalan classes, do you participate differently?
>
> Alex: In Catalan...
>
> Jane: There was more interaction. The students were more.. hands up perhaps in English you were sat like this ((mimes students sitting passively)) listening.. do you think that too.. what did you think, Alex?
>
> Alex: Is what you say because in English some people don't... can't...
>
> Jane: They can't speak or they can't understand? Or maybe both?
>
> Alex: Both.

Extract 7.16 (La Garriga)

> Jane: In class, when Maria speaks in Catalan, do you participate more?
>
> S1: Yes
>
> Jane: Why?
>
> S1: I don't know know how to speak in English like I can in Catalan.. because of this

Looking back on extract, 7.15, I can see that I was leading the students in this interview by giving them examples of what I thought had happened. Saying that, Alex agrees with my comments that the students could neither understand nor speak in English in the lessons.

Both pupils and the teachers agreed that low participation is due to pupils not having the English level to participate. However, if we return to the point made in extract 7.9, that pupils spoke more in their *extraescolar* English lessons, we can see that a more ELT-style set of tasks could have remedied this low level of speaking. Also participation is more than speaking alone. As the transcripts reveal, pupils participated actively in the CLIL lessons when there were practical activities to do. All the pupils conducted experiments, drew diagrams and wrote up results, whereas, often in the L1 lessons, a few pupils dominated the talk, while the others sat passively.

7.4 Student views 2012

In 2012, when I went back to La Garriga to interview Maria, I took the opportunity to talk to her current group of *bachillerato* science students, since several of these pupils had participated in the CLIL project in the academic year 2008-2009. When pupils are 16, they can choose to continue their academic studies in either science subjects or arts and humanities subjects (everyone has to continue with English until they are 18). Alternatively, students can leave school at 16 or do vocational training at a college of further education. The pupils in Maria's bachillerato science group had all chosen the science route and would be expected to go on to study a science subject at university.

I gave a questionnaire (see Appendix 11) to everyone in Maria's 2012 group. The pupils who had participated in the CLIL programme of 2008-2009 answered a series of open questions about their experience, and there was a section on attitudes to learning for all pupils, in which they circled a number to show how much they agreed with each statement. This time, I chose to write the questionnaire in Catalan, to make it quicker and easier for pupils to understand the questions and write their answers.

The CLIL students

Three years on, these pupils were mostly very positive about the effect the CLIL lessons had had on their English. They all answered that their level of English had improved that year, particularly in regard to their science vocabulary and listening skills.

Commenting on the difference between learning science in their L1 and English, some pupils commented that it had been a difficult experience. One said, '*caldria estudia el vocabulari abans de feu le classe i a vegades no entenies le mitat de l'explicacio, tot ni que jo m'en vaig sortir força bé'* //You had to study the vocabulary before the class and sometimes I didn't understand half of the explanations, although it went quite well//. This comment is consistent with my findings from the transcripts (see extract 6.5 in chapter 6) that when pupils were not given the vocabulary at the beginning of the lesson, they struggled to understand and participate. Maria and Belén had both expressed a concern in their interview that sometimes pupils did not understand the lessons, and that despite enjoying the experiments with English, they had not grasped what they were doing and why.

These same five CLIL pupils were asked whether they preferred to study science in English or in their L1 and to explain why. Two of the pupils chose English. One said this was because using English to study science gave them the opportunity to improve their English at the same time as learning science. The other one said that English was an easy language to learn, and CLIL lessons gave them the opportunity to improve their level in a language that is 'so important today.' Another pupil said that studying in English or Catalan made no difference since they had 'understood the same'. In contrast, two of the group chose Catalan as their preferred language of study. One of these two pupils said that they preferred to study science in Catalan because they could express themselves more fluently in that language. The other said that they had already done English in school and *extraescolar* lessons, and they did not feel any need to spend more time learning English.

Learning preference

All of the students who completed a questionnaire were asked how they liked to study science, for example with practical activities or classroom discussion. 13 out of the 14 students cited practical activities as their preferred method of study, although five said they thought it was important for there to be a theoretical component to lessons.

One student thought that it was better for practical activities to take place before the theory. '*Trobo que es important fer activitats practiques precedides d'una explicacion teóretic per tal d'entendre l'assimilar els conceptes estudiats.*' //I think that it is important to do practical activities before a theoretical explanation is given to understand and assimilate the concepts studied.// This is almost the opposite of what Maria said when she was concerned that pupils were participating in experiments without fully understanding what they were doing. Maria would have preferred for pupils to first learn the theory and then participate in a practical activity. However, it is consistent with the idea, shared by all of the teachers, that whole units should be taught in English, rather than one-off classes, to give pupils the chance to consolidate what they were learning. As another pupil observed, the combination of theory and practice brought the ideas to life and showed that that they lived not just in the laboratory, but in real life as well. '*M'agrada estudiar ciencies com ha estem fent actualment , doncs combinem teoria amb practica alhora i es mes agradable i instructiu. Es fas una idea mes xxxx al que passo a caus es en la realitat.*' //I like to study science as we are currently doing, because by combining theory with practice at the same time it is more enjoyable and instructive. It makes an idea more real and you get an idea that something occurs due to xxxx in reality.//

Pupils' other suggestions of ways they would like to study included other graphic and interactive methods such as through the use of models and representations or ICT in the classroom. None of the pupils was in favour of a purely theoretical approach to learning science. One pupil commented that this was how they learnt biology, and they did not like this method of learning.

'*Les ciéncies crec que va molt bé de representa tot el que anem fent i feu una practica o semblant. jo faig biologia, i no fem practica, crec que n´hauriem de fer alguna per entendre millor el que s'explica.'* //Science, I think is best represented by doing practical activities or something similar. I do biology and we don't do practical activities. I think that we should do something like this to better understand what is being explained.//

In these responses, pupils are talking about science in general, rather than CLIL, and they show that pupils much prefer an interactive learning experience. Maria's doubts about her CLIL lessons largely stemmed from her feeling that pupils were less engaged when the language of instruction was English, than when it was Catalan. This view was based on the lower number of student contributions in the CLIL lessons. However, these responses from her *bachillerato* pupils point to the opposite being the case. In her practical activities, even though pupils were not speaking very much, they would have been more involved and engaged. In the theoretical lessons conducted in Catalan, despite there being more student participation, pupils would have been less engaged due to the theoretical nature of the lessons.

Attitudes towards English and science

The results of the second part of the questionnaire are presented in table 7.2 below. The results indicate that the CLIL pupils had a more positive view of English as a subject and as a language, than the non-CLIL pupils. For example, the average response to the first question, 'I like studying English' was 4.6 among the former CLIL pupils, but only 3.5 among the non-CLIL pupils. Similarly for the second question, 'I usually get good results in English', the average was 4 among CLIL students and 3.1 among non-CLIL. The CLIL pupils were more likely to agree that having a good level of English was important for their future (5) than the non-CLIL group (4.4).

Both the CLIL and non-CLIL pupils had the same attitudes towards science as subject, and the results they obtain in it. Both groups answered an average of 4.2 to the statement, 'I like studying science'. Similarly, both groups answered an average of 3.8 to the statement, 'I usually get good results in science'. While the experience of studying CLIL had given pupils a more positive view of English, it had not had the same effect on their view of science. This response demonstrates that the CLIL pupils did not share a particularly optimistic outlook (any more than the non-CLIL group had a pessimistic world-view).

What is surprising, given the CLIL groups' positive view of English, is their reluctance to study science or another subject in English in the future. The CLIL group were slightly more in favour of the suggestion than their non-CLIL classmates, but only marginally so (see table 7.2).

Obviously, this group of five pupils is a small sample of the original 60 or so pupils who studied CLIL with Maria and Belén in 2nd of ESO. In addition, the fact that they are studying science at *bachillerato* level shows they are among the more able and academic students.

Table 7.2: Results of 2012 follow-up questionnaire

	Pupils who had studied CLIL 2008-2009					**Average of CLIL pupils**	**Pupils who had not studied CLIL**									**Average of non-CLIL pupils**
Pupil no:	1	2	3	4	5		6	7	8	9	10	11	12	13	14	
1. I like studying English.	5	4	5	4	5	4.6	2	4	4	4	3	5	3	2	5	3.5
2. I usually get good results in English.	5	3	4	4	4	4	2	4	3	4	3	5	3	2	3	3.1

	Pupils who had studied CLIL 2008-2009					Average of CLIL pupils	Pupils who had not studied CLIL									Average of non-CLIL pupils
Pupil no:	1	2	3	4	5		6	7	8	9	10	11	12	13	14	
3. I want to study English at university.	4	4	5	5	4	4.4	3	2	3	4	4	4	3	1	4	3.1
4. It is important for my future that I have a good level of English.	5	5	5	5	5	5	4	5	2	5	5	5	4	5	5	4.4
6. I like studying science.	4	5	4	5	3	4.2	5	3	3	4	5	5	4	4	5	4.2
7. I usually get good results in science.	3	4	4	4	4	3.8	4	5	3	3	5	4	3	4	4	3.8
8. I want to study science at university	3	5	2	5	3	3.6	4	3	2	4	4	3	4	1	3	3.1
9. I would like to studying science in English in the future.	2	5	2	4	2	3	3	1	3	4	4	4	3	1	3	2.5
10. I would like to study other subjects in English.	3	4	5	1	3	3.2	1	4	3	4	3	5	3	1	4	2.5

7.5 Conclusion

This chapter has examined the views of teachers and students who participated in the CLIL courses in both schools featured in the main study. Despite the differences between the schools, attitudes towards CLIL were similar among teachers and students.

Among teachers, their views can be summarised as follows:

- The use of L1, although not ideal, was necessary to help students follow the content of the classes.

- There were problems getting students to use English in class, due to their low levels of competence in English. Using ELT-style speaking activities, however, was not a solution as they are ‘artificial’ and do not encourage genuine communication.

- Teaching the scientific content of the course was more important than teaching English.

Using practical activities and a wide variety of tasks was beneficial to students.

- There is a need for better materials.

- Teaching whole units in English is preferable to teaching units in a mixture of L1 and English.

- Teaching CLIL takes more effort than teaching in students’ L1.

One point where they differed was on the subject of whether CLIL is for everyone, with the La Garriga teachers arguing that groups should be mixed, while Albert thought they should be streamed. The decision on whether to stream pupils was not made by the teachers, but by the schools’ management teams. Maria and Belén did not have the experience of teaching CLIL to streamed groups and Albert did not have the experience of teaching mixed groups. Without the experience of teaching different types of students, it difficult for them to give an informed opinion on the subject. Despite this, I think it is positive that the teachers thought that the way their school had organised their CLIL groups was the right way.

The students’ views on CLIL were also similar, and can be summarised in the following points:

- Studying science in English is more difficult that studying in L1.

- The CLIL lessons were good for their English, particularly their speaking and listening skills. This indicates that, like the Polish students in Marsh et al’s study (2008), they could see the rewards of their hard work.

- Despite seeing the benefits of the CLIL lessons, they did not want to repeat the experience with another subject. This suggests that, like the teachers, they found it draining in terms of the effort required.

- Their competence levels in English were too low for them to participate effectively.

- The experiments and practical activities helped them learn, and were enjoyable to do.

- The students who spoke a language other than Catalan or Spanish at home had the most positive view of the CLIL lessons. No doubt, this is because they are used to studying in a language that is not their mother tongue.

- The students who participated in the follow-up questionnaires had a more positive view of their level of English than students in the same *bachillerato* science group who had not participated in the CLIL course three years earlier.

Chapter 8. Conclusion

The study was set up to explore interaction and discourse in CLIL and L1 secondary science classrooms in Catalonia, and it has identified a number of differences between CLIL and L1 teaching practices and student participation. The study has also sought to investigate how teachers scaffold learning in their CLIL lessons and overcome problems of understanding. Current literature on CLIL in Spain has mostly focused on content and language learning outcomes through testing. In this study, I used multiple data collection methods, in particular discourse analysis, to seek answers to the following three questions:

1. How was the spoken interaction in the L1 and the CLIL lessons different? Was one lesson type more monologic or dialogic?
2. What strategies did teachers use to scaffold learning in the CLIL lessons? How did learners benefit from these strategies?
3. What methods did teachers employ to overcome problems of understanding without using L1?

In addition, I wanted to look at how Maria's CLIL teaching developed between the main study and the follow up study and find out how the pupils who had participated in the main study viewed CLIL.

8.1 Interaction in the L1 and CLIL lessons

By using SETT and IRFEx discourse analysis of the lesson transcripts, I have been able to demonstrate the differences between the CLIL and L1 lessons in terms of interaction and discourse. This question was more thoroughly investigated through the SETT and IRFEx data than from the classroom observations, which were less systematic.

As I outlined in chapters 5 and 6, the CLIL lessons had a more rigid structure than the L1 lessons, and the IRFEx analysis demonstrates that teachers and students stayed within their roles. In contrast, in the L1 lessons, students and teachers often swapped roles. Students were almost as likely as the teacher to ask an I-move question, which then put the teacher in the position of giving an R-move answer. In the L1 lessons, students make 48% of I-moves and 8% of Ex-moves, which shows their involvement in asking questions. In the CLIL lessons, students only made 8% of I-moves and 3% of Ex-moves. At the same time, Maria made 16% of R-moves in her L1 lessons, which shows a reversal of roles, where she answered students' questions. In contrast, in the CLIL lessons, teachers made only 5% of R-moves. We also saw the teacher using student responses in L1 lessons to build up content knowledge and using students as primary-players. These findings make a strong case for there being a more dialogic style of teaching in place in the L1 lessons than in the CLIL.

The typology of questions asked in the CLIL lessons also contributed to the more monologic teaching style. The teachers elicited more facts and fewer explanations in the CLIL lessons, while more why-questions and referential questions were asked in the L1 lessons. The reasons for this different typology clearly relates to teachers' perceptions of student understanding, and we saw several examples in the transcripts of teachers attempting to ask a why-question, and then simplifying it when faced with several seconds of silence.

The quality of student contributions varied between lessons, and some teachers were better than others at asking questions that students were able to answer and and getting them to contribute to other students' understanding. We saw this when Albert asked students to give him examples of types of energy and also in this extract when he persists with a line of questioning, rephrasing the question and rejecting students incorrect or inadequate answers.

Extract 8.1. Lesson 20 (Albert)

52	T	...so one thing we are going to deal with is how to measure temperature. If I give you a pot with water and they ask you the temperature of this water what temperature have this water? how can you give me an answer? ((repeats question in Spanish))
53	S	xxxxx ((answer in Spanish))
54	T	but how can you know exactly
55	S	//it depends//
56	T	no the answer is not //it depends//
57	S	with a thermometer

Here we see that that the types of questions a teacher asks are key to students' contributions and that CLIL practice does not exist in only one form, but in many forms, depending on the teacher and the techniques they use in their classroom.

From the interviews with teachers, it is clear that they preferred teaching in their L1 due to the high level of student participation. In the interview with Maria and Belén, I told them that I had noticed a higher level of student participation in the L1 lessons and very few instances of students asking or answering questions in the CLIL. Maria agreed. She said, 'that's what I'm worried about.. because you've been seeing a lot of people.. teachers .. because I would like to find a way for them to ask and to find this possibility and I don't know if other teachers can do that'. At the same time, Belén was so disappointed with how the CLIL lessons had gone that she had decided not to teach in English the following year. They both found students in the CLIL lessons very quiet and felt like they were not getting through to them. This is despite the evidence in the L1 transcripts that shows the proportion of students making an active contribution was low and students could take the teacher off topic for several minutes at a time. However, even if the majority of students had had a significantly higher level of English, I do not think that the L1 teaching methods would have worked in the CLIL lessons. Having only two or three students dominating the talk, would have meant that the students with lower levels of English or a more limited understanding of the science would have most probably fallen behind. Instead, a more structured approach to teaching was necessary, which we will look at in the next section on scaffolded learning. At the same time, the more rigid structure of the CLIL lesson while less enjoyable for the teacher, suited the students in these groups and improved the teachers' chances of achieving their learning goals.

This study shows that while student communication was limited in the CLIL lessons (reflected in both the IRFEx and SETT analyses), teachers did not adopt adequate strategies to encourage speaking. The student that observed that he spoke more in *extraescolar* English classes than in the CLIL classes made a valuable point: that students with his level of English can speak, but they need the support to do so, for example, through the use of pre-taught useful language or speaking frames. Therefore, regarding classroom interaction and communication in CLIL lessons, I think this study highlights two problem areas that can be addressed with teacher training:

Firstly, to encourage student participation, CLIL teachers need to plan and make time for speaking activities, and also pre-teach useful structures in much the same way that ELT teachers do. The CLIL teachers in the main study felt ill-equipped or embarrassed to set up a task of this kind, and thought they would be artificial or contrived. As Maria said in her interview, ‘we would like them to speak in a natural way.. I told you.. I don’t want this artificial ... (activities).’ However, until teachers embrace this type of task, they will be unable to fulfill the communication aspect of the 4Cs framework. An example of a task that teachers could have used to get students talking is an information gap task to share the results of an experiment. In the elephants and hippos task in lesson 19, a task could have involved Student A reading out the question: ‘What temperature was the water in the hippo after ____ (5) minutes?´ to which Student B would have answered ‘_____ (37) degrees celsius’ and then asked, ‘What temperature was the water in the elephant after _____ (10) minutes’, etc.   An activity like this would not have been artificial as there is a genuine need for students to communicate to find out each other’s results. Using set phrases on a useful language sheet, similar to the refugees debate (see Appendix 5) I did in the initial study could also have been effective. For example, in lesson 16, students could have talked about the results of the experiment using sentence prompts: ‘When you heat the ball, the metal _________ (expands)’ or ‘This experiment shows that when metal is _________ (heated), the particles __________ (expand and move faster).

Secondly, there were missed opportunities to get students talking in the recorded lessons. In the L1 lessons, teachers often asked students to describe something (What colour is this? What does it remind you of?) or to say if they had seen an example of something (Do you have a marble kitchen counter in your house?). The CLIL students would have been able to answer these questions, so encouraging CLIL teachers to ask more referential questions could help increase student participation.

8.2 Strategies to scaffold learning in the CLIL lessons.

The study shows that in the CLIL lessons, there was a greater number of distinct tasks In the heat unit (see Appendix 10), for example, these included:

- a vocabulary matching task to pre-teach language such as ‘lukewarm’ and ‘allow’

- a gap fill, which checked students' understanding of key concepts. For example, ____________ (temperature) is measured in degrees Celsius (°C) and indicates how hot something is.
- question prompts that students answered during a practical activity. During the activity in which students heat a ball and try to pass it through a hole, they are asked: Did the ball go through the hole easily? Yes/No.
- pictures that illustrate the particles in the ball. Students have to choose which picture corresponds to the heated particles to check their understanding of the concept that heated particles expand and move faster.
- a video that shows an experiment on gas dilatation. Students have to write the instructions and then draw what happens to a balloon.

Moreover, teachers took more time to explain each task and make sure students came away from it with a clear understanding of the main points. In the L1 lessons that I observed, the majority of class time was spent in transmission mode. While students did have a printed dossier, it was used more as a reference and I did not see students working on activities from the dossier during the lessons.

This research also demonstrates the importance of scaffolding and lesson planning in CLIL lessons. We saw that when teachers pre-taught vocabulary relevant for a lesson, students were more able to contribute in class and for longer. Techniques for teaching vocabulary were more visual in the CLIL lessons. A common technique was to hold up the materials to be used in an experiment before class and ask students to name them. There were also several tasks on the heat dossier in which students matched vocabulary to its definition or a picture. Fewer vocabulary questions arose in the L1 lessons, and when they did, they were dealt with verbally. For example:

Extract 8.2. Lesson 13 (Maria)

S	què vol dir res?	what does *res* //nothing// mean?

T	res, vol dir veure transparent, totalment transparent...no veuria partícules, ni veuria cap posat entremig, ni veuria absolutament res.	*res* means to see through.. totally transparent.. you wouldn't see particles.. nor anything in between.. you wouldn't see anything

In the lessons in which students were asked questions before any vocabulary had been explained, they struggled to form any answers and had to be prompted by the teacher with the relevant vocabulary.

A problem that I observed with the courses featured in this study is the inconsistency of using English as the language of instruction. Teaching in whole units would have enabled pupils to learn a whole topic in English, and given them the chance to build on previously learnt vocabulary and subject matter each lesson. The most successful unit was the one about heat, which was based on a unit that Maria had developed while studying CLIL at the University of Nottingham and contained structured lessons, in which vocabulary was pre-taught and students participated in a variety of task types. This study attests to the importance of planning lessons in this way and using a variety of task types to achieve learning outcomes. In the heat unit, students were led through a series of short tasks, including experiments, drawing, gap fills, videos, discussion and writing. These tasks were structured in a way to build on students' knowledge and understanding. For example, in lesson 16, students learnt vocabulary such as 'lukewarm', 'fill' and 'ice' at the beginning of the lesson. They were then giving instructions for an experiment. As Belén gave them the instructions, she held up the materials (the bowls, where they could get hot and cold water from, etc) for students to see. Students completed the activity in small groups, which involved putting their hands in the different bowls of water to see how they felt. As they worked on the experiments, they answered a series of questions on the dossier (Appendix 10), which first helped them understand what they were feeling during this experiment, and then led them to an understanding of thermal energy transfer. The questions were:

- Do you feel the same sensation of heat or cold in both hands? Yes/No
- Do you think that touch allows us to know the temperature of an object as well as (with the same accuracy) with a thermometer? Yes/No

Students then looked at a drawing to illustrate energy transfer from a hot object to a cold one and they completed a gap fill: The transfer of energy finishes when both objects have the _______ _________ (same temperature).

This was just the first 20 minutes of the lesson, but students had already completed four tasks. This abundance of activities meant that students could not help but be actively involved in the lessons.

Furthermore, the same point was often taught in several different ways. For example, when students learnt that heat causes particles to expand first with the heated ball experiment and a few minutes later by watching a balloon on a video. The teachers cited this as having a positive effect on learning outcomes and exam performance. It also meant that students of all levels, including the three students with learning difficulties in Maria's group, could participate actively throughout each lesson.

When lessons were not planned in such detail and used printed materials, as in Maria's L1 lessons, there were fewer stages to each lesson, and they mostly involved teacher-led discussion with some breaks for note taking. In contrast, when printed material was used, many more SETT modes can be seen, which implies there were more stages to a lesson. In my view, when a lesson had more stages, and particularly when tasks were creative, the students had a more enjoyable learning experience. Students reported this in the interviews when I asked them what their favourite lesson had been that year, each citing a lesson with a practical component. From my observations of lessons, it also seemed clear to me that students participated more when a lesson contained lots of different tasks, while in the L1 lessons with fewer tasks, many students appeared less engaged. The transcripts also indicate that having a printed dossier available meant that pupils were able to participate in longer speaker turns, as we saw in Belén's lessons. All of the teachers used the dossier created for the heat unit, and they agreed that the unit had gone well, since it combined theory with practice, and enabled pupils to build on existing knowledge.

The findings of this study make a strong case against streaming students by level on CLIL courses. The teachers views on this varied, and I can understand why Albert thought streaming worked well in his school, which included many students who were new to Catalonia and needed time to adapt to the language and culture of a new country.

However, the success of the heat unit in involving all students, including those with special educational needs, shows that streaming is unnecessary if teachers have the appropriate materials.

On a similar point, this research demonstrates that in CLIL lessons, teachers cannot get through as much content and in as much depth as in their L1 lessons. This was a persistent worry of Maria's, who thought that the level of the science and the pace of the lessons should not be compromised in the CLIL lessons. The variety of tasks in each lesson and the IRFEx exchanges, which involved more repetition and more teacher turns to elicit a student contribution, show that the pace of CLIL lessons will inevitably be slower. Accepting that fewer points will be covered in a lesson, and teaching one or two key points in a dynamic and multi-modal way, would mean that teachers could achieve their lesson aims. An obstacle to reducing the amount of content taught in a lesson is the emphasis on formal exams in the Catalan education system. As I have mentioned earlier, students usually sit two written exams per term in each subject. Despite calls to reduce the reliance on exams and assess CLIL through portfolios of work (e.g. Short, 1993), the way students were assessed in all three of the schools in this study was through written exams that used a similar structure to the L1 exams that students usually sit. However, in order to reflect the slower pace of learning and more task-based format of the CLIL lessons, teachers should design assessment tools based on students' project work and participation in lessons.

In terms of scaffolding strategies for CLIL, therefore, I recommend teaching whole courses (or at least units) in CLIL, adopting multi-modal teaching strategies with printed materials and teaching less content at a slower pace. This will mean that schools will not need to stream students, although the way they test and assess students' knowledge should be revised and move away from the current emphasis on written exams.

8.3 Methods employed by teachers to overcome problems of understanding without using L1

We saw in the transcripts that the teachers in the study employed a variety of strategies to overcome problems of understanding without using L1, such as using realia to pre-teach vocabulary and using practical activities, videos and drawing tasks to make learning more visual and less linguistic. However, this study demonstrates that the Catalan teachers found it very difficult to avoid using L1 in the classroom. They all did so with the good intention of aiding understanding, and they justified their high use of L1 by saying that they would not have been able to teach students without it. For example, they often used L1 to rephrase a question, when they thought that students had not understood it in English. But, their use of L1 was not always necessary. The Catalan teachers all used L1 to repeat content, without students requesting that they do so, and they often said 'si' instead of 'yes' and 'molt bé' instead of 'very good', terms that all secondary students know in English and do not need to hear in their L1.

The lessons where teachers relied more on L1, were those where the main vocabulary had not been taught at the beginning of the lesson. This strengthens the argument for pre-teaching vocabulary and using a printed dossier in English, which students can refer to.

The findings of the study also show that using L1 to ask a question made students more likely to answer in L1, and that the more a teacher used English, the more the students used English. The interviews revealed that one student, in particular, got so used to the teacher repeating herself in L1, that he did not try to understand the English as he knew an L1 translation would follow.

One issue with the delivery of CLIL in Catalonia is that it is almost always taught by content specialists rather than English specialists. Some CLIL teachers no doubt have an interest in English and language, but the teachers in this study were very much focused on the science. Maria commented that for her, the course was 100% Science and 0% English. As a result, the English aspect was neglected in favour of the science, which resulted in a high incidence of L1 among teachers and students, and very little focus on developing students' English skills.

While there is a teacher training solution to the problem of teachers' over reliance on L1, namely to develop communication strategies that do not use it, I think this will be one of the more difficult problems to overcome. While all of the teachers in the study were happy to adopt a multi-modal approach to teaching, which was not too far removed from their current practice, consistent use of English was something that none of the teachers was able to achieve. The low levels of English competence of students in these schools is obviously an issue, but, I think there is also a policy implication here. Training and the use of well-designed materials will help, but as long as CLIL is managed and taught by content specialists, who see achieving their content goals as the priority, the language aspect of CLIL will continue to be secondary.

8.4 Three years on

The findings of the study show that the CLIL lessons left a positive impression on the students who participated in them. The CLIL pupils who I interviewed three years later had a more positive view of English as a subject and as a language, than the non-CLIL pupils. They agreed more strongly with the statement, 'I like studying English' (4.6 out of 5 compared with 3.5 among the non-CLIL pupils). Similarly for the question, 'I usually get good results in English', the average was 4 among CLIL students and 3.1 among non-CLIL. The CLIL pupils were also more likely to agree that having a good level of English was important for their future (5) than the non-CLIL group (4.4).

This is in contrast with the view of the teachers, particularly Maria and Belén, who had lost enthusiasm for CLIL by the end of the course, partly from the effort taken to plan and deliver classes and partly because of the lack of student participation they perceived. In fact, three years on Maria had scaled back on her CLIL teaching, only using it occasionally with her *bachillerato* students. She said that part of the reason why she was not teaching in English was because she found it more difficult than teaching in Catalan and had never been able to get pupils to contribute in English in her classes. She also stressed the importance of teaching science over English, saying that the science aims were 100% and English 0%. The six exams that students have to sit each year, while excessive in her view, meant that getting pupils to learn the science content had become her main focus.

8.5 Limitations of the study

I have already described some of the limitations of this study, most notably in chapter 3. However, I will outline the two main types of limitations here.

The first limitation relates to the courses themselves, which perhaps were not ‘pure’ CLIL courses due to the large number of lessons taught in students’ L1, and the high use of L1 in the lessons that were supposed to be taught in English. Despite this, these courses are fairly representative of how CLIL is currently taught in Catalonia in mainstream public and *concertada* schools. More and more schools are using printed course books in English, which means a greater proportion of lessons over the academic year will be taught in English. These books are often created by ELT publishers, such as Macmillan and Oxford, and contain ELT-style speaking activities, which should increase the amount of talk time by students in lessons. However, teachers' use of L1 in their CLIL lessons to repeat key learning points will only reduce when students' English competence levels increase or if teachers change their attitudes to how much they can teach in English and are prepared to reduce learning goals.

The second limitation relates to data collection. The use of transcripts of recorded lessons was effective in showing what happened in teacher-led segments of a lesson. However, in the CLIL lessons, a large proportion of lesson time was spent in group work, and I was not able to capture the dialogue that occurred during these sections. I did, however, keep notes on what was happening at each stage of a lesson, which I could draw on when I analysed the data. In the initial study, in which I taught the lessons, I was able to record some examples of students working together on tasks in English. However, in the main study, which was much more reliant on transcripts as its principal source of data, when I left my voice recorder with students during tasks, they only spoke in L1, so this discourse was not discussed in the final dataset.

8.6 Contributions of the study

This study makes a significant contribution to the field of classroom discourse analysis. The development of my own coding system for classroom discourse (IRFEx) adds to previous work on initiation, response and feedback sequences by Sinclair and Coulthard (1975), Lemke (1990) and Dalton-Puffer (2007). My additional Ex (extension) move will enable researchers using this framework to identify when a teacher expands on a topic by asking extension questions. This will demonstrate that a greater depth of content has been explored than when a teacher asks successive I (initiation) questions.

Because of the political importance of CLIL as a methodology in Spain, research has often focused on outcomes, with the hope that students enrolled in CLIL programmes will learn the same amount or more content as non-CLIL students, while developing their proficiency in English. In some previous Spanish studies, students were chosen on the basis of their proficiency in English and their (and in some cases their parents') enthusiasm for the project (e.g. Lasagabaster, 2008, Campo et al, 2007 and Lasagabaster and Sierra, 2009). No doubt the choice to include what were perceived to be the best students was made to maximise the success of the research. My choice of schools and students marks this study out from previous Spanish research due its inclusion of students from non-Spanish or Catalan backgrounds in addition to some with special educational needs and disabilities. By including students from a diverse range of backgrounds, I have been able to show that CLIL as an approach works well for students from all backgrounds, and in the case of students who speak a language other than Catalan or Spanish at home, even better than for those from a Spanish or Catalan speaking background.

The methodological approach I used in comparing the L1 and CLIL lessons given by the same teacher to the same students is also new to the Spanish context. By analysing L1 and CLIL lesson transcripts, I have been able to demonstrate that CLIL lessons were more scaffolded with a greater number of distinct tasks and more multi-modal input and materials than L1 classrooms.

8.7 Future research

CLIL is continuing to gain momentum in Catalonia with more and more schools developing CLIL programmes. Pre-service teachers now receive CLIL training as standard, and in the next few years, it is anticipated that children in every year of school from *primaria* to *bachillerato* will spend three hours a week in CLIL lessons. As CLIL moves to the mainstream in Catalan schools, interest in its effectiveness as a strategy and the results it brings will increase. I hope to continue research and teacher training in this area and focus on two areas in particular.

Firstly, I would like to explore the problem of low motivation among teachers. The teachers in this study were reluctant to teach CLIL in subsequent years, although it was the teacher who had most training (Maria) who persevered the longest. It would be interesting to examine the impact of regular training courses or peer to peer networking on teachers' motivation to continue teaching CLIL. I think teachers often feel that they are working in a vacuum, particularly if they are the one who is championing CLIL at a school or the only one teaching it. Continued training and opportunities to network with other CLIL teachers could provide a solution to the problem, and a potential research project could measure teachers' motivation to teach CLIL according to factors such as how recently they have received CLIL training, how often they have access to CLIL training and whether they are in reguar contact with CLIL teaching peers.

Secondly, I would like to investigate ways to help content teachers encourage student talk and give more space in their lessons to integrating the language component of CLIL, which can be perceieved as less important than the content. This research would take the form of a classroom intervention study, in which teachers use specifically-designed speaking activities in class aimed at providing students with the tools they need to complete a task (for example the one described in section 8.1 of this chapter).To establish the effectiveness of the intervention, I would record small groups of students speaking during tasks and compare their use of English with groups who are not giving a structured task, but are told to work together in English.

This study has provided a description and analysis of CLIL classrooms in two very different (yet typical) Catalan schools. The conclusions presented in this study show that while teachers adopt strategies to scaffold learning in their CLIL lessons, they are neglecting the language or communication aspects of CLIL, which results in an over reliance on L1. If CLIL is to be the success that everyone hopes it will be in Catalonia, then a change in both teacher training and education policy is needed.

References

Admiraal, W., Westhoff, G. and de Bot, K. (2006). Evaluation of bilingual secondary education in the Netherlands: Students' language proficiency in English. *Educational Research and Evaluation.* London: Routledge, 12, 1, pp. 75-95

Alexander, R. J. (2001). *Culture and Pedagogy: international comparisons in primary education.* Oxford: Wiley-Blackwell

Alexander, R. J. (2008). *Essays on Pedagogy,* London: Routledge

Alexander, R. J. (2012) *Towards Dialogic Teaching: Rethinking classroom talk,* Cambridge: Dialogos

Allen R, Frohlich, M. and Spada, N. (1984). The Communicative Orientation of Language Teaching: An Observation Scheme. In J. Handscombe, R.A. Orem and B. Taylor (Eds.), *On TESOL '83: The Question of Control*. Virginia: Teachers of English to Speakers of Other Languages, Inc.

Amidon, E. and Hunter E. (1967). Verbal interaction in the classroom: The verbal interaction category system. In E. Amidon and J. Hough (Eds.), *Interaction analysis. Theory, research, and application*. Reading, MA: Addison-Wesley, pp. 141-149

Anderson, L.W. and Krathwohl D.R. (Eds.) (2001). *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*. New York: Longman

Baker, C. (1988). *Key Issues in Bilingualism and Bilingual Education*. Clevedon: Multilingual Matters

Bakhtin, M.N. (1986). *Speech genres and other late essays.* Austin: University of Texas Press

Banbrook, L. and Skehan, P. (1990). Classrooms and display questions. In C. Brumfit and R. Mitchell (Eds), *Research in the Language Classroom.* London: Modern English Publications and the British Council.

Beatty, J.W. and Woolnough, B.E. (1982). Why do practical work in 11-13 science? *School Science Review.* Hatfield, Herts: The Association for Science Education, 63. pp. 758-70

BERA (2004). *Revised ethical guidelines for educational research*.British Educational Research Association. https://www.bera.ac.uk/wp-content/uploads/2014/02/ethica1.pdf?noredirect=1

Bloom, B.S. (1956). *Taxonomy of Educational Objectives, Handbook I*: The Cognitive Domain. New York: Longman

Bonnet, A. (2012). Towards an Evidence Base for CLIL: How to Integrate Qualitative and Quantitative as well as Process, Product and Participant Perspectives in CLIL Research. *International CLIL Research Journal,* 1, 4, pp. 66-78

Breidback, S. and Viebrock, B. (2012). CLIL in Germany: Results from Recent Research in a Contested Field of Education. *International CLIL Research Journal* 1, 4, pp. 5-16

Brewster, J. (2009).*Thinking skills for CLIL.* London: Macmillan http://www.onestopenglish.com/thinking-skills-for-clil/501197.article

Brock, C.A. (1986). The Effects of Referential Questions on ESL Classroom Discourse. *TESOL Quarterly.* Virginia: Wiley, 20, 1 (March 1986) pp. 47–59

Bruner, J.S. (1960). *The Process of Education*. Cambridge, Mass: Harvard University Press

Bruner, J.S. (1983). *In search of mind: Essays in autobiography*. New York, NY: Harper & Row

Bruner, J.S. (1996). *The Culture of Education*. Cambridge, Mass: Harvard University Press

Bruner, J. S. (2006). *In Search of Pedagogy Volume 1. The Selected Works of Jerome Bruner, 1957-1978*. London: Routledge

Campo, A., Grisaleña, J. and Alonso, E. (2007). *Trilingual Students in Secondary School: A New Reality.* Bilbao: Basque Institute of Educational Evaluation and Research.

Carnap, R. (1966). *Philisophical Foundations of Physics: An Introduction to the Philosophy of Science.* London: Basic Books

Celaya, M. and Ruiz de Zarobe, Y. (2010). First languages and age in CLIL and non-CLIL contexts. *International CLIL Research Journal,* 1, 3, pp. 60-66

Cloud, N., Genesee, F. and Hamayan, E. (2000*). Dual language instruction: A handbook for enriched education*. Boston, MA: Heinle & Heinle Publishers

Cohen, L., Manion, L and Morrison, K. (2007). *Research methods in education*, London: Routledge/Falmer

Corin, A. (1997). A course to convert Czech proficiency to proficiency in Croatian and Serbian. In S.B. Stryker and B. L. Leaver (Eds) (1997), *Content-based Instruction in foreign language education: Models and methods*. Washington DC: Georgetown University Press

Cousin, G. (2005). Case study research. *Journal of Geography in Higher Education*. London: Routledge, 29, 3, pp. 421–427.

Coyle, D. (1999). Theory and planning for effective classrooms: supporting students in content and language integrated learning contexts. In J. Masih (Ed.), *Learning through a foreign language*, London: CILT

Coyle, D. (2008). Content and Language Integrated Learning Motivating Learners and Teachers. Extract from *The CLIL Teacher's Toolkit: a classroom guide.* http://blocs.xtec.cat/clilpractiques1/files/2008/11/slrcoyle.pdf

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

Creswell, J. (1998). *Qualitative inquiry and research design: Choosing among five traditions*. Thousand Oaks, CA: Sage.

CRLE (*Centre de Recursos de Llengües Estrangeres)* (2006). CLIL in Catalonia. In N. Figueras (Ed.) *CLIL in Catalonia, From theory to practice*. Girona: APAC Monographs, 6, pp. 31-37

Cullen, R. (2002). Supportive teacher talk: The importance of the F-move. *ELT Journal.* Oxford: Oxford University Press, *56,* pp.117–27

Cummins, J. (1979). Cognitive/academic language proficiency, linguistic interdependence, the optimum age question and some other matters. *Working Papers on Bilingualism*. Toronto: Ontario Institute for Studies in Education, 19, pp. 121-129.

Cummins, J. (1981). The role of primary language development in promoting educational success for language minority students. In California State Department of Education (Ed.), *Schooling and language minority students: A theoretical framework.* Los Angeles: Evaluation, Dissemination and Assessment Center, California State University.

Cummins, J (1984). *Bilingualism and Special Education: Issues in Assessment and Pedagogy.* Clevedon: Multilingual Matters

Cummins, J. (1987). Immersion programs: Current issues and future directions. In L.L. Stewin and S.J. McCann (Eds.), *Contemporary educational issues: The Canadian mosaic*. Toronto: Copp Clark

Cummins, J. (1996). *Negotiating identities: Education for empowerment in a diverse society.* Los Angeles: California Association for Bilingual Education

Cummins, J. (1998). Immersion education for the millennium: What have we learned from 30 years of research on second language immersion? In M.R. Childs and R.M. Bostwick (Eds.), *Learning through two languages: Research and practice. Second Katoh Gakuen*

International Symposium on Immersion and Bilingual Education. Katoh Gakuen, Japan, pp. 34-47

Cummins, J. and Swain, M. (1986). *Bilingualism in education: Aspects of theory, research and practice*. London: Longman

Dalton-Puffer, C. (2007). *Discourse in Content and Language Integrated Learning (CLIL) Classrooms.* Amsterdam: John Benjamins

Dalton-Puffer, C. (2008). Outcomes and processes in Content and Language Integrated Learning (CLIL): Current research from Europe. In W. Delanoy and L. Volkmann (Eds.), *Future perspectives for English Language Teaching.* Heidelberg, Germany: Universitatsverlag Winter, pp. 139-157

Dalton-Puffer, C. (2011). Content-and-Language Integrated Learning: From Practice to Principles? *Annual Review of Applied Linguistics.* Cambridge, UK: Cambridge University Press, 31, pp. 182-204.

De Jabrun, P. (1997). Academic achievement in late partial immersion French. *Babel*. Amsterdam: John Benjamins Publishing Company, 32, 2, pp. 20-23

Dewey, J. (1938). *Education and Experience.* New York: Collier Macmillan

Dörnyei, Z, (2007). Creating a motivating classroom environment. In J. Cummins and C. Davison (Eds.), *The International Handbook of English Language Teaching*. New York: Springer, pp. 639-651.

Driver, R. and Leach, J. (1993). A Constructivist View of Learning: Childrens' Conceptions and the Nature of Science. In R.E. Yager (Ed.) *What research says to the science teacher: The science, technology, society movement*. Washington, DC: National Science Teachers' Association, pp. 103-112

Easterby-Smith, M., Thorpe, R., and Lowe, A. (1991). *Management Research. An Introduction*. Sage: London

Edwards, A.D., Westgate, D.P.G. (1994). *Investigating Classroom Talk (Second Edition)* . London: The Falmer Press

Ellis, R. (1999). *Learning a second language through interaction.* Studies in Bilingualism. Amsterdam/Philadelphia: John Benjamins Publishing Company, 17

European Commission Barometer Survey (2012). *Europeans and their languages.* Special Eurobarometer 386. http://ec.europa.eu/public_opinion/archives/ebs/ebs_386_en.pdf

Eurostat (2014). *European Labour Force Survey.* http://ec.europa.eu/eurostat/statistics-explained/index.php/EU_labour_force_survey_%E2%80%93_data_and_publication

Fabregat, E., Roig, X., Adsaur, I. and Sevillano, M. (2005). The Use of English as the Language of Instruction in Natural Sciences: Two Experiments in CLIL. In D. Coyle (Ed.) *Catalonia, from Theory to Practice*, APAC Monographs. Girona: APAC, 6

Faiella, G. (2004). *Spain, a primary source cultural guide*. New York City: Rosen Publishing

Foster, P. (1998). A Classroom Perspective on the Negotiation of Meaning. *Applied Linguistics*. Oxford: Oxford University Press, 19, 1, pp. 1-23

Fundación Raval Solidari (2015) *Población de Raval*
http://www.braval.org/es/p/punto_de_analisis_del_entorno_social/poblacion_del_raval

Gardner, H. (1983). *Frames of Mind: The Theory of Multiple Intelligences.* New York: Basic Books

Gass, S. Mackey, A. and Pica, T. (1998). The role of input and interaction in second language acquisition. *Modern Language Journal,* 82. Hoboken, NJ: Wiley-Blackwell, pp 299-307.

Generalitat de Catalunya (2014) *Us del castellà, l'anglès, el francès i/o l'alemany com a llengua* vehicular (The use of Spanish, English, French or German as a vehicular language). Barcelona: *Departament d'Ensenyament Secretaria de Polítiques Educatives*

Genesee, F. (1978). Is there an optimal age for starting second language instruction? *McGill Journal of Education*, 13, pp. 145-54

Genesee, F. (1987). *Learning through two languages: Studies of immersion and bilingual education.* Rowley, MA: Newbury House

Genesee, F. (1994). *Integrating language and content: Lessons from immersion*. Educational Practice Report 11. National Center for Research on Cultural Diversity and Second Language Learning. Washington DC: George Washington University

Gilbert, S. W. and Ireton, S. W. (2003). *Understanding Models in Earth and Space Science*. Virginia: NSTA Press

Goodwin, W.L. and Goodwin, L.D. (1996). *Understanding Quantitative and Qualitative Research in Early Childhood Education*. New York: Teachers College Press.

Gray, D. (2004). *Doing Research in the Real World*. London: Sage Publications

Grimalda, G. (2006). Which Relation between Globalisation and Individual Propensity to Co-operate? Some Preliminary Results from an Experimental Investigations*. CSGR Working Paper 214/6.*
http://www2.warwick.ac.uk/fac/soc/csgr/research/workingpapers/2006/wp21406.pdf

Hajer, M. (2000). Creating a language-promoting classroom: Content-area teachers at work. In J. K. Hall and L. Stoops Verplaetse (Eds.), *Second and foreign language learning through classroom interaction.* Mahwah, NJ: Erlbaum, pp. 265-285

Harley, B., Allen, P., Cummins, J. and Swain, M. (1991). *The development of second language proficiency*. Cambridge, UK: Cambridge University Press.

Hellekjær, G.O. (2010). Language Matters: Assessing lecture comprehension in Norwegian English-medium higher education. In C. Dalton-Puffer, T. Nikula and U. Smit (Eds.), *Language Use and Language Learning in CLIL Classrooms*. Philadelphia/Amsterdam: John Benjamins Publishing Company

Hernández Sierra, M. (2006). Science and CLIL in D Coyle (Ed.), *CLIL in Catalonia, from Theory to Practice*. APAC Monographs. Girona: APAC, 6

Hodson, D. (1993). Re-thinking old ways: towards a more critical approach to practical work in school science. *Studies in Science Education.* Abingdon, Oxon: Taylor and Francis, 22 pp. *85-142*

Housen, A. (2002). Process and Outcomes in the European Schools Model of Multilingual Education. *Bilingual Research Journal* (Spring 2002). London: Routledge, 26, 1

Housen, A. and Baetens Beardsmore, H. (1987). Curricular and extracurricular factors in multilingual education. *Studies in Second Language Acquisition*. Cambridge, UK: Cambridge University Press, 9, pp. 83-102

Hymes, D. (1972). On communicative competence. In J.B. Pride and J. Holmes (Eds.), *Sociolinguistics*. London: Penguin Books, pp. 269-293

Institut d'Estadística de Catalunya (2007). *Demographic Survey of Catalonia*. Idescat

Jexenflicker, S. and Dalton-Puffer, C. (2010). The CLIL differential: Comparing the writing of CLIL and non-CLIL students in higher colleges of technology. In C. Dalton-Puffer, T. Nikula, and U. Smit (Eds.), *Language use and language learning in CLIL classrooms.* Amsterdam, the Netherlands: John Benjamins, pp. 169-190

Jiménez Catalán, R.M., Ruiz de Zarobe, Y. and Cenoz, J. (2006). Vocabulary profiles of English Foreign Language learners in English as a subject and as a vehicular language. *Vienna English Working Papers* (Special Issue: Current Research on CLIL 1), 15, 3

Johnson, K. (1982). *Communicative Syllabus Design and Methodology,* Oxford: Pergamon Institute of English

Johnson, M. (2004). *Developmental Cognitive Neuroscience,* Oxford: Blackwell

Johnson, R. K. and Swain, M. (1997). *Immersion education: International perspectives.* Cambridge, UK: Cambridge University Press.

Jones, M. (2001). The issue of bias and positionality in cross-cultural, educational studies – enhancing the validity of data through a reflective-reflexive approach. Paper presented at Higher Education Close Up Conference, Lancaster University, 16-18 July 2001. http://www.leeds.ac.uk/educol/documents/00001733.htm

Kasper, G. (2001). Four perspectives on L2 pragmatic development. *Applied Linguistics*. Oxford: Oxford University Press, 22, 4 pp. 502-530

Kerr, J. F. (1964). *Practical Work in School Science* Leicester: Leicester University Press

Klee, C. A. and Tedick, D. J. (1997). The undergraduate foreign language immersion program in Spanish at the University of Minnesota. In S. B. Stryker, and B. L. Leaver, (Eds.), *Content based instruction in foreign language education*. Washington, DC: Georgetown University Press, pp. 141-173

Krashen, S.D. (1981). *Second Language Acquisition and Second Language Learning*. Oxford: Pergamon

Krashen, S.D. (1985). *The Input Hypothesis: Issues and Implications*. New York: Longman

Kuhn, TS (1970) *The Structure of Scientific Revolutions*. Chicago, London: University of Chicago Press Ltd

Lasagabaster, D. (2008). Foreign language competence in content and language integrated courses. *The Open Applied Linguistics Journal,* 1, pp. 31-42.

Lasagabaster, D. and Ruiz de Zarobe, Y. (Eds.) (2010). *CLIL in Spain: Implementation, Results and Teacher Training*. Newcastle upon Tyne: Cambridge Scholars Publishers.

Lasagabaster, D. and Sierra, J.M. (2009): Language Attitudes in CLIL and Traditional EFL classes. International CLIL Research Journal. 1, 2, pp. 4-17.

Leach, J. and Scott, P. (1995). The demands of learning science concepts: issues of theory and practice. *School Science Review*. Hatfield, Herts: The Association for Science Education, 76, 277, pp. 47-51

Leach, J. and Scott, P. (2000). Children's thinking, learning, teaching and constructivism. In M. Monk and J. Osborne (Eds.) (2000) *Good Practice in Science Teaching: What Research has to say.* Maidenhead: Open University Press

Lemke, J.L. (1990). *Talking Science: Language, Learning, and Values.* Norwood: NJ Ablex

Lincoln, Y. S. and Guba, E. G. (1985). *Naturalistic inquiry.* Newbury Park, CA: Sage

Llinares, A. and Whittaker, R. (2010). Writing and speaking in the history class: A comparative analysis of CLIL and first language contexts. In C. Dalton-Puffer, T. Nikula, U.

Smit (Eds) *Language Use and Language Learning in CLIL Classroms*, Philadelphia/Amsterdam: John Benjamins Publishing Company

Llinares, A., Morton, T. and Whittaker, R. (2012). *The Roles of Language in CLIL.* Cambridge, UK: Cambridge University Press

Long, M.H. and Sato, C.J. (1983). Classroom foreigner talk discourse: forms and functions of teachers' questions. In H.W. Seliger and M.H. Long (Eds.) *Classroom oriented research in second language acquisition*. Rowley, Mass: Newbury House

Lynch, T. (1996). *Communication in the language classroom*. Oxford: Oxford University Press

Lyster, R. (1987). Speaking immersion. *Canadian Modern Language Review*. Toronto: University of Toronto Press, 43, pp. 701-717

Lyster, R. (1994). *La négociation de la forme: Stratégie analytique en classe d'immersion*. Canadian Modern Language Review. Toronto: University of Toronto Press, 50, pp. 447-465.

Lyster, R. (1998). Negotiation of form, recasts, and explicit correction in relation to error types and learner repair in immersion classrooms. *Language Learning*. London: Routledge, 48, 2, pp. 183–218.

Lyster, R. (2007). *Learning and teaching languages through content: A counterbalanced approach*. Amsterdam/Philadelphia: John Benjamins.

Mach, E. (1943). *Popular Scientific Lectures.* Translated by T. McCormack, 5th ed. La Salle, IL: Open Court

Mackenzie, N. and Knipe, S. (2006). Research Dilemmas: Paradigms, Methods and Methodology. *Issues in Educational Research*. Institutes for Educational Research in NSW, NT, SA and WA Australia, 16, 2, pp. 193-205

Mariotti, C. (2006). Negotiated interactions and repair. *VIEWS Vienna English Working Papers, 15,* pp. 33–41.

Marqués, P (2014). *El fracas escolar en España es culpa de cómo se enseña en el aula*. Te interesa.es. http://www.teinteresa.es/educa/Pere_Marques-fracaso-escolar-Espana-culpa-didactica-escuela-UAB-pedagogia-TIC_0_1074493242.html

Marsh, D. (2000). *Using Languages to Learn and Learning to Use Languages*. D. Marsh and G. Langé (Eds.). Finland: University of Jyväskylä

Marsh, D. (2002). *CLIL/EMILE - The European dimension: Actions, Trends and Foresight Potential*. Finland: University of Jyväskylä

Marsh, D., Enner, C. and Sygmund, D. (1999). *Pursuing Plurilingualism*. Finland: University of Jyväskylä

Marsh, D., Zając, M., Golebiowska, H., Czura, A., Gapinska, A., Papaja, K., Roda, M., Urbaniak, M. (2008). *Profile Report Bilingual Education (English) in Poland - Overview of Practice in Selected Schools* .Warszawa: CODN; British Council, Poland. Finland: University of Jyväskylä

McDowell, L. (1992). Multiple voices: speaking from inside and outside the project. *Antipode.* Wiley-Blackwell, 24, 56-72.

Meara, P. (1992). *EFL vocabulary test*. Swansea, UK: Centre for Applied Language Studies.

Mehan, H. (1979). *Learning lessons: Social organization in the classroom.* Cambridge, MA: Harvard University Press

Mehisto, P. and Lucietto, S. (2010). *CLIL Essentials*. CLIL Consortium

Menegale, M. (2011). Teacher questioning in CLIL lessons: How to enhance teacher-students interaction. In C. Escobar Urmeneta, N. Evnitskaya, E. Moore, and A. Patiño (Eds.) *AICLE-CLIL-EMILE: Educació plurilingue. Experiencias, research & polítiques.* Belleterra, Spain: Universitat Autonoma de Barcelona, pp. 83-99

Mercer, N. (1995). *The Guided Construction of Knowledge: Talk amongst Teachers and Learners.* Clevedon: Multilingual Matters

Meyer, O. (2010). *Towards quality-CLIL: Successful planning and teaching strategies.* http://revistapulso.cardenalcisneros.es/documentos/articulos/114.pdf

Ministerio de Educación, Cultural y Deporte (2014). *Real Decreto 1105/2014, de 26 de diciembre, por el que se establece el currículo básico de la Educación Secundaria Obligatoria y del Bachillerato. Agencia Estatal Boletin Oficial de Estado.*

Mohan, B. and Van Naerssen, M. (1997). Understanding cause and effect: Learning through language. *English Teaching Forum*. Washington, DC: United States Department of State, 35, 4, pp. 22–30

Moje, E. B. (1995) Talking about science: An interpretation of the effects of teacher talk in a high school science classroom. In *Journal of Research in Science Teaching* (April 1995). Wiley, 32, 4, pp. 349–371

Monk, M. and Dillon, J. (2000) The Nature of Scientific Knowledge. In Monk, M. and Osborne, J. (Eds.) (2000) *Good Practice in Science Teaching: What Research has to say, Maidenhead: Open University Press*

Mortimer, E. and Scott, P. (2000). Analysing discourse in the science classroom in R. Millar, J. Leach and J. Osborne (Eds.) *Improving science education: The contribution of research*. Buckingham, UK: Open University Press

Muñoz, C. (2002). Relevance and Potential of CLIL. In D. Marsh (Ed.) *CLIL/EMILE – The European Dimension. Actions, Trends and Foresight Potential*. Strasbourg: European Commission.

Murray Bosrock, M. (1997). *Put your best foot forward.* Minnesota: International Education Systems.

Musumeci, D. (1996). Teacher-learner negotiation in content-based instruction: Communication at cross-purposes. *Pragmatics*. Elsevier, 12, 4, pp. 447-468.

Nathan, M. J., Kim, S. and Grant, T. S. (2009). *Instituting Change in Classroom Discourse Structure: Human and Computer-Based Motif Analysis*. Wisconsin Center for Education Research

Navés, T. (2007). *Does CLIL have a future in our schools?* University of Barcelona

Navés, T., Miralpeix, I. and Celaya, M.L. (2005). Who transfers more … and what? Crosslinguistic influence in relation to school grade and language dominance in EFL. *International Journal of Multilingualism*. London: Routledge, 2, 2, pp. 1-22

Navés, T. and Victori, M. (2010). CLIL in Catalonia: an Overview of Research Studies. In Y. Ruiz de Zarobe and D. Lasagabaster (Eds*.) CLIL in Spain: Implementation, Results and Teacher Training*. Cambridge: Cambridge Scholars Publishing

Newman, I. and Benz, C.R. (1998). *Qualitative-Quantitative Research Methodology: Exploring the Interactive Continuum*. Carbondale, IL: Southern Illinois University Press.

Nikula, T. (2010). Effects of CLIL on a Teacher's classroom language use. In C. Dalton-Puffer, T. Nikula and U Smit (Eds*.), Language Use and Language Learning in CLIL Classrooms*. Philadelphia/Amsterdam: John Benjamins, pp. 105-124

Nikula, T., Dalton-Puffer, C. and Llinares, A. (2013). CLIL classroom discourse. *Journal of Immersion and Content Based Education*. Philadelphia/Amsterdam: John Benjamins, 1, 1, pp. 70-100

Nunan, D. (1987). Communicative language teaching: making it work. *ELT Journal*. Oxford: Oxford University Press, 41, 2, pp. 136-45

Nunn, R. (1999). The Purposes of Language Teachers' Questions. *International Review of Applied Linguistics in Language Teaching*, IRA. (Feb. 1999). Berlin: De Gruyter, 37, 1, pp. 23-42

Pascual-Peña, I. (2010). Teachers' questions in CLIL contexts*. VIEWZ (Vienna English Working Papers)*, 19, 3, pp. 65-71.

Patton, M.Q. (1980). *Qualitative Evaluation Methods*. London: Sage Publications Ltd

Pérez-Vidal, C. (2007). The need for focus on form in content and language integrated approaches: an exploratory study. In F. Lorenzo, S. Casal, V. de Alba and P. Moore, (Eds.), *Models and Practices in CLIL. Revista Española de Lingüística Aplicada (RESLA)* Volumen monográfico. Logroño: Asociación Española de Lingüística Aplicada, pp. 39-53

Piaget, J. (1923).*The Language and Thought of the Child*, London: Routledge (2001 edition)

Piaget, J. (2001). *Studies in Reflecting Abstraction*. Hove, UK: Psychology Press

Popper, K. (1972). *Objective Knowledge.* Oxford: Oxford University Press

Programme for International Student Assessment (PISA) (2012*). What 15-year-olds know and what they can do with what they know: Key results from PISA 2012*, OECD

Robson, C. (2011). *Real World Research.* Chichester: John Wiley & Sons

Rojas-Drummond, S. and Mercer, N. (2004). Scaffolding the development of effective collaboration and learning. *International Journal of Educational Research*. Elsevier, 39, pp. 99-111.

Ruiz de Zarobe, Y. (2007). CLIL in a bilingual community: Similarities and differences with the learning of English as a Foreign Language. *Vienna English Working Papers*, 2, 16, 3, pp. 47-53.

Ruiz de Zarobe, Y. (2008). CLIL and foreign language learning: A longitudinal study in the Basque country. *International CLIL Research Journal*, 1, pp. 60–73.

Ruiz de Zarobe, Y. (2010). Written production and CLIL: An empirical study in Language Use and Language Learning in CLIL Classroms. In C. Dalton-Puffer, T. Nikula and U. Smit (Eds.) *Language Use and Language Learning in CLIL Classrooms*. Philadelphia/Amsterdam: John Benjamins Publishing Company

Sahlberg, P. (2007). Education Policies for Raising Student Learning: The Finnish Approach. *Journal of Education Policy*. London: Routledge, 22, 2, pp. 173-197

Schrönkhammer, M. (2012). *Communication and Interaction in Content and Language Integrated Learning (CLIL) Classes in Physics: A Theory-based Analysis of Classroom Practice in Austrian Schools (*Masters thesis). University of Vienna

Schuitemaker-King, J. (2012). *Teachers' strategies in providing opportunities for second language development* (PhD thesis). University of Groningen, The Netherlands

Seedhouse, P. (1996). Classroom interaction: possibilities and impossibilities. ELT Journal. Oxford: Oxford University Press, 50, 1, pp. 16-24

Senasac, B. V. (2002). Two-way bilingual immersion: A portrait of quality schooling. *Bilingual Research Journal*. London: Routledge, 26, 1, pp. 85-101

Short, D.J. (1993). Assessing Integrated Language and Content Instruction. *TESOL Quarterly* (Winter, 1993). Wiley, 27, 4, pp. 627-656

Silverman, D. (2009) *Doing Qualitative Research: A Practical Handbook.* London: Sage

Sinclair, J. and Coulthard, M. (1975). *Towards an analysis of discourse: The English used by teachers and pupils.* Oxford: OUP

South, H. (ed) (1999) *The Distinctiveness of English as an Additional Language: a cross-curricular discipline*. Watford: NALDIC, pp. 17

Snow, M.A., Met, M. and Genesee, F. (1989). A conceptual framework for the integration of language and content in second/foreign language instruction. *TESOL Quarterly.* Wiley, *23,* pp. 201-217

Stern, H.H. (1984). *The Immersion Phenomenon: English-Speaking Canadians Come to Grips with the Country's Language Duality*. Washington DC: ERIC Clearinghouse

Swain, M. (1975). Writing skills of grade three French immersion pupils. *Working Papers on Bilingualism.*Toronto: Ontario Institute for Studies in Education, 7, pp. 1-38

Swain, M. (1985). Communicative competence: Some roles of comprehensible input and comprehensible output in its development. In S. Gass and C. Madden (Eds.) *Input in Second Language Acquisition.* New York: Newbury House, pp. 235-256

Swain, M. (2000). The output hypothesis and beyond: Mediating acquisition through collaborative dialogue. In J.P. Lantolf (Ed.) *Sociocultural Theory and Second Language Learning*. Oxford: Oxford University Press, pp. 97-114

Swain, M. and Lapkin, S. (1982). *Evaluating bilingual education.* Clevedon: Multilingual Matters

Swain, M. and Lapkin, S. (1995). Problems in output and the cognitive processes they generate: A step towards second language learning. *Applied Linguistics*. Oxford University Press, 16, 371-391.

Swain, M. and Lapkin, S. (1998). Interaction and second language learning: Two adolescent French immersion students working together. *Modem Language Journal*. Wiley-Blackwell, 83: 320-37

Tardif, C. (1994). Classroom teacher talk in early immersion. *Canadian Modern Language Review*, University of Toronto Press, 50, 3, pp. 466-481

Throne, R. (2013). What is positionality in practioner research? Dissertation Scholar. http://dissertationscholar.blogspot.com.es/2013/04/what-is-positionality-in-practitioner.html

Tobin, K. (1990). Research on science laboratory activities: In pursuit of better questions and answers to improve learning. *School Science and Mathematics.* Wiley, 90, 5, pp. 403-418

Torras, M. R., Navés, T., Celaya, M. L. and Pérez-Vidal, C. (2006). Age and IL development in writing. In C. Muñoz (Ed.), *Age and the rate of foreign language learning.* Clevedon: Multilingual Matters, pp. 156-183

Van de Craen, P., Ceuleers, E. and Mondt, K. (2007). Cognitive development and bilingualism in primary schools: Teaching maths in a CLIL environment. In D. Marsh and D. Wolff (Eds.), *Diverse contexts—converging goals: CLIL in Europe*. Frankfurt am Main, Germany: Lang, pp. 185–200

Van Zee, E. H., and Minstrell, J. (1997). Using questioning to guide student thinking. *The Journal of the Learning Sciences*, 6. London: Routledge, pp. 227-269

Vázquez-Díaz, A. (2010). Study of linguistic transfer in CLIL students' oral discourse. In *Journal of Linguistics and Second Language Acquisition. Views. Vienna English Working Papers*, 19, 3

Vygotsky, L. S. (1978). *Mind in Society: The Development of Higher Psychological Processes*. Cambridge, Mass: Harvard University Press

Vygotsky, L. S. (1987). *The collected works of L. S. Vygotsky* (R. W. Rieber and A. S. Carton, Eds.) New York: Plenum

Walsh, S. (2006). *Investigating Classroom Discourse.* Abingdon: Routledge

Walsh, S. (2011). E*xploring Classroom Discourse: Language in Action.* London: Routledge.

Watson, R. (2000). The role of practical work. In M. Monk and J. Osborne (Eds.) (2000) *Good Practice in Science Teaching: What Research has to say.* Maidenhead: Open University Press

Watson, J. R., Prieto, T. and Dillon, J (1995). The effect of practical work on pupils' understanding of combustion, *Journal of Research in Science Teaching*. Wiley, 32(5), 487-502.

Wells, G. (1993). Reevaluating the IRF sequence: A proposal for the articulation of theories of activity and discourse for the analysis of teaching and learning in the classroom. *Linguistics in Education*. Elsevier, 5, 1, pp. 1–37.

Wells, G. (1999). *Dialogic inquiry: towards a sociocultural practice and theory of education,* Cambridge, UK: Cambridge University Press

Westhoff, G. (2004). The art of playing a pinball machine: Characteristics of effective SLA-tasks*. The Journal of Language Teaching and Learning* (2004). Babylonia, 3, pp. 58-62.

Willis, J (1996). *A Framework for Task-Based Learning.* London: Longman

Wintergest, A. C. (1993). Why-Questions in Classroom Discourse. *College ESL* (Jul 1993).Washington DC: ERIC, 3, 1, pp. 70-79

Wolpert, L (1992) *The Unnatural Nature of Science.* Boston: Harvard University Press

Yassin, S. Marsh, D., Ong, T.E. and Ying Ying, L. (2009). Learner's perceptions towards the teaching of Science through English in Malaysia: a quantitative analysis. *International CLIL Research Journal*, 1; 2, pp. 54-69.

Yassin, S., Tek, O., Alimon, H., Baharon, S. and Ying, L. (2010). Teaching Science Through English: Engaging Pupils Cognitively. *International CLIL Research Journal*, 1(3). 46-59.