Universidade de Aveiro Departamento de Educação e Psicologia
2020

VALENTINA PIACENTINI

EDUCAÇÃO EM CIÊNCIAS E INTEGRAÇÃO DO INGLÊS PARA A APRENDIZAGEM: ESTUDO DE UMA ABORDAGEM CLIL NUMA ESCOLA DO 3.º CICLO EM PORTUGAL

SCIENCE EDUCATION AND THE INTEGRATION OF ENGLISH FOR LEARNING: STUDY OF ONE CLIL APPROACH IN A PORTUGUESE LOWER SECONDARY SCHOOL

Universidade de Aveiro Departamento de Educação e Psicologia
2020

VALENTINA PIACENTINI

SCIENCE EDUCATION AND THE INTEGRATION OF ENGLISH FOR LEARNING: STUDY OF ONE CLIL APPROACH IN A PORTUGUESE LOWER SECONDARY SCHOOL

Tese apresentada à Universidade de Aveiro para cumprimento dos requisitos necessários à obtenção do grau de Doutor em Educação (ramo, Didática e Desenvolvimento Curricular), realizada sob a orientação científica da Doutora Ana Raquel Gomes São Marcos Simões, Professora Auxiliar do Departamento de Educação e Psicologia da Universidade de Aveiro e do Doutor Rui Marques Vieira, Professor Auxiliar c/ Agregação do Departamento de Educação e Psicologia da Universidade de Aveiro.

Apoio financeiro da FCT (Fundação para a Ciência e Tecnologia), comparticipado por fundos nacionais do Ministério da Ciência, Tecnologia e Ensino Superior (MCTES) e pelo Fundo Social Europeu (FSE) através do POCH – Programa Operacional Capital Humano (SFRH/BD/102895/2014)

Dedico este trabalho à minha família…a de origem na Itália e à que se foi construindo aqui em Aveiro

o júri

presidente

Professor Doutor Artur da Rosa Pires
professor catedrático do Departamento de Ciências Sociais, Políticas e do Território da Universidade de Aveiro

Professor Doutor António Augusto de Freitas Gonçalves Moreira
professor associado do Departamento de Educação e Psicologia da Universidade de Aveiro

Doutora Laura Valdés Sánchez
professora associada da Universidade de Vic – Universidade Central de Catalunha

Doutora Clara Maria da Silva de Vasconcelos
professora auxiliar c/agregação da Faculdade de Ciências da Universidade do Porto

Doutora Ana Sofia Reis de Castro e Pinho
professora auxiliar da Faculdade do Instituto de Educação da Universidade de Lisboa

orientadora

Professora Doutora Ana Raquel Gomes São Marcos Simões
professora auxiliar em regime laboral do Departamento de Educação e Psicologia da Universidade de Aveiro

agradecimentos

É preciso sempre começar por alguém. Acima de todas, a pessoa para abrir esta secção de agradecimentos não pode deixar de ser o Gareth: foi por ele que vim (ou melhor, voltei) para Portugal para começar a aventura do doutoramento e foi ele que me deu uma “supervisão doméstica”, quer no projeto para a candidatura à FCT, quer nos artigos que compõem esta tese.
Não é fácil continuar, no agradecer às pessoas que me ajudaram no caminho, porque, ao longo deste processo que é académico, se enredaram outros processos: o ter mudado para estudar em outro país e o chegar a ser mãe, logo de duas filhas … e foram muitas as pessoas que, assim, acompanharam este processo de estudo e mudança de vida. Porque estou longe da minha família de origem, é com ela que quero prosseguir: à minha mãe, que nunca deixou de cuidar da própria filha e de cultivar o seu ser avó de duas netas da mesma idade mas muito diferentes, não só a distância mas também nos vários "de dois em dois meses” que se sucederam em Aveiro nos últimos três anos; ao meu pai e ao meu irmão Mauro que, com menos palavras e visitas da minha mãe, sempre pensaram e acreditaram em mim e na minha aposta; ao meu irmão Ale, que se responsabilizou e procurou fazer sentido à burocracia de dois países burocráticos ligada à irmã e que, sempre que podia, apanhava um voo para acompanhar as sobrinhas crescerem, e a irmã mãe delas.
Em terra estrangeira, também acabei por arranjar umas tias (ex professoras e viajantes, como a Tia Malu). Um agradecimento especial vai à Tia Zé que não nos fez faltar domingos e ajuda em família e uma figura afetiva constante que as meninas também têm precisado.
A@s amig@s, @s de sempre desde que conheço o Gareth e(m) Aveiro …
a Andréia e a Mercedes que já viveram cá e foram viver mais ou menos longe, a Glória em Lisboa, o Duncan e o Kieran que cá continuam, gostando e construindo, e a Gena, agora a fazer um doutoramento em Educação também … e @s que fui criando por serem também pais. Pelos momentos de convívio, por me sentir entendida, por se tornarem mães ao mesmo tempo (verdade, Agnes?), pelo *babysitting* com as meninas (obrigada, Ana!), por saber que posso sempre contar … como com a Cristina, Sofia e Sara. E pela dança contemporânea à que a minha amiga Paula Cristina me iniciou.
A academia também foi prolífica de relações amigáveis, sendo que, entre “laboratórios abertos” e “corredores empáticos”, várias pessoas vivenciaram o doutoramento comigo: a Ângela e a nossa aproximação delicada e constante de uma secretária para outra e que, com uma pergunta, desbloqueou o processo consciente da escrita da tese; a Luciana que me iniciou na análise de conteúdo e apoiou o projeto sempre que precisei; a Betina e as ideias e os ideais que partilhamos entre validações e refeições; a Susana e umas semelhanças que se têm desvelado dia atrás dia, entre uma orientação invisível e outra; a Gabriela que foi minha colega de turma e conselheira sobre assuntos infantis; a Patrícia e o passar do você ao tu que não impediu que me desse algumas orientações; a Marisa e os nossos almoços amigos tardios e que me perguntou se tinha pensado em fazer uma tese por artigos; a Amanda que se disponibilizou para validar quadros de categorias e a ideia da tese por artigos; a Carolina que me ajudou a ver que sim sabia arguir e que sabia fazê-lo também em espanhol;

a Vanessa e a síncrona reta final da escrita, as emoções que isto implica e o passarmos de colegas, a amigas e familiares; a Sandra e a Tati que vieram dos países delas a fazer um estágio de doutoramento e a marcar uma amizade que ainda continua; o Maurício, "irmãozinho" angolano que partilhou o espaço do LALE nestes últimos dois anos, em circunstâncias académico-burocráticas parecidas às minhas; e @s nov@s lalean@s (o Francisco e a Bruna) que viram, neste meu intenso trabalho, o que eventualmente será a fase terminal da escrita, coitadinh@s, mas com @s quais não faltou o bom convívio.
Com outra idade ou outra função, agradeço também ao António Moreira (ou Professor António, nunca sei como lhe devo chamar) que, desde o projeto apresentado na disciplina opcional sob a sua docência à minha recente decisão de fazer uma tese por artigos, tem acompanhado validações e desesperos do estar num percurso doutoral. À Helena Araújo e Sá que me tem dado, querendo ou não, vários "pontapés académicos" e com a qual tem havido um intenso fluxo de roupa infantil. Agradeço aos meus orientadores, a Ana que me fez sentir acolhida quando nos encontramos a primeira vez e que sempre apreciou a minha maneira de ser também na academia, o Rui que acima de tudo recomendava que aproveitasse das minhas filhotas, os estilos diferentes dos dois, o encorajamento que os dois souberam dar quando precisava … e os prazos acordados que me permitiram finalizar as ideias, menos dia mais dia. À Ana Sofia Pinho e ao seu olhar externo e profundo, desde a defesa do projeto (17 de julho de 2015) até à da tese final (27 de maio de 2020).
À Fundação para a Ciência e a Tecnologia (FCT) que financiou o meu projeto aqui no país e fora e às pessoas que me atenderam para várias situações sempre de uma maneira fluida, sem acrescentar carga à minha condição burocrática já carregada. Às investigadoras que com simpatia me orientaram durante uma estadia no estrangeiro: Cristina Escobar Urmeneta e Laura Valdés-Sánchez na Autònoma de Barcelona e Ana Llinares e Natalya Evnitskaya na Autónoma de Madrid … e às amigas (Marta, Raquel e Cristina) que voltaram a acolher-me nas duas cidades. Às professoras da escola, colegas de trabalho sem as quais o meu estudo empírico não tinha sido possível. Ao Papà Renato que ajudou a formatar a minha primeira dissertação em 2003 e à sua família que está agora a ajudá-lo a recuperar. Estico-me, também, no agradecimento à série "*How I met your Mother*", porque aliviou os antes-de-ir-dormir mesmo durante a fase final da escrita da tese.
Last but not least, à Zoe e à Aria, as minhas filhas queridas, que permitiram que escrevesse esta tese de *doutoresa* também nos fins de semana do ano 2019 preste a acabar e que se aperceberam logo que a mãe tinha menos disponibilidade e mais desassossego. Agradeço-as também porque um "livro", com elas, pode sempre mostrar imagens diferentes, contar histórias diferentes e falar línguas diferentes, uma experiência que se tem vindo a intensificar durante a "quarentena" por Covid-19. E volto a agradecer ao Gareth porque é só por ele ser o companheiro que é … que eu consegui conciliar o ser mãe e o doutoramento e que a tese chegasse até ao fim.

palavras-chave

CLIL (Aprendizagem Integrada de Língua e Conteúdo); educação em Ciências com foco na Língua; ILF (Inglês como Língua Estrangeira); desenho de estudo de caso; métodos qualitativos; 3.º ciclo do ensino básico português.

resumo

O desenvolvimento de ambientes significativos para a aprendizagem das Ciências e línguas estrangeiras na escola é uma preocupação educacional atual e, numa perspetiva global, a educação também precisa estar orientada para a literacia científica e para a proficiência linguística. As investigações sobre a integração do Inglês no ensino das Ciências, tal como sobre o foco na Língua(gem) na educação científica são, portanto, altamente relevantes. Além da verbal, diversas linguagens são usadas no ensino das Ciências, tais como as linguagens visuais, matemáticas e operacionais, no fazer, explorar, discutir, etc. próprios das Ciências, e no dar sentido durante o processo de construção do conhecimento. Os professores nem sempre estão cientes das dificuldades de aprendizagem dos alunos, mesmo quando a língua materna é a língua de ensino. Alguns estudos revelam que práticas de ensino conscientes das línguas e de outros modos semióticos implícitos nas Ciências são benéficos para a aprendizagem das Ciências. O CLIL (Aprendizagem Integrada de Língua e Conteúdo, tradução do inglês *Content and Language Integrated Learning*) é, precisamente, uma possível abordagem educacional, baseada no princípio de que as línguas são aprendidas enquanto são usadas em atividades socialmente relevantes, visando tanto a compreensão do conteúdo por parte dos alunos (uma disciplina específica ou parte de uma disciplina) quanto a aquisição de uma língua adicional (estrangeira ou segunda). Pensado para a aquisição de uma Língua estrangeira durante o seu uso nas aulas de um determinado Conteúdo, o CLIL é um exemplo de educação interdisciplinar, envolvendo configurações autênticas e estratégias de ensino e aprendizagem centradas nos alunos. Além disso, o CLIL pode representar um contexto de investigação para avaliar a importância do ensino voltado para a língua e as linguagens, como no caso do projeto "*English Plus*" (EP) com abordagem CLIL, no qual as Ciências são ensinadas e aprendidas com e em Inglês, junto de turmas do 3.º ciclo do ensino básico de uma escola pública no norte de Portugal.

As nossas questões de investigação focaram-se na compreensão 1) das práticas de língua e linguagens no âmbito da educação em Ciências na experiência dos professores e alunos do projeto; 2) da relação entre a presença do Inglês e o programa EP de Ciências.

Para tal, desenhou-se um estudo de caso descritivo-explicativo do projeto EP, no ano letivo 2015-2016, integrando os participantes que estiveram envolvidos no programa em diferentes momentos e com diferentes níveis (dois professores de Inglês e dois de Ciências Naturais; 11 alunos antigos e 96 atuais do EP, em relação ao ano do nosso estudo empírico). Devido às condições contextuais do projeto PE, foi adotada uma abordagem etnográfica para que a investigadora se familiarizasse com o contexto do projeto e os seus atores. Recolhemos dados a partir de diferentes fontes e através de diversas técnicas: entrevista semiestruturada a professores e ex-alunos; questionário semiestruturado a alunos atuais; observação participante "de graus diferentes" e não estruturada das práticas em sala de aula, dos planos de aula e de outros contextos; documentos de natureza escolar institucional ou os do professor. Realizamos uma análise indutiva do conteúdo das transcrições das entrevistas a professores e alunos, bem como das respostas abertas ao questionário do aluno. A estatística descritiva das respostas fechadas ao questionário do aluno e a leitura das anotações da investigadora e dos documentos escolares triangularam os resultados e complementaram a compreensão.

Os resultados trouxeram evidências independentes de uma maior consciencialização dos professores sobre o uso da língua e das linguagens (linguagem verbal na língua materna ou em Inglês, e outras modalidades de representação) quando uma língua adicional está presente no ensino das Ciências. Por outras palavras, devido à presença da língua inglesa, um professor (de uma dada disciplina) pode tornar-se mais consciente das dificuldades (com a língua e as linguagens) e estilos de aprendizagem de cada aluno, estando melhor preparado para a mudança de estratégias e recursos. Portanto, além do benefício do avanço na proficiência no Inglês, uma metodologia de ensino que reconhece e valoriza a língua (mesmo quando é a língua materna a ser falada), é também importante para melhorar a educação da disciplina específica e a aprendizagem dos alunos. Os nossos resultados abrem espaço, assim, para uma reflexão mais ampla sobre as práticas e a formação de professores orientadas para o ensino e a aprendizagem das Ciências, bem como sobre a possibilidade de outras investigações. O nosso estudo, esperamos, potencia a investigação sobre o CLIL em Portugal e, entre outras contribuições, enriquece o campo de estudo sobre as práticas de Ciências, com e sem abordagem CLIL.

keywords

CLIL (Content and Language Integrated Learning); language-focused Science education; EFL (English as a Foreign Language); case study design; qualitative methods; Portuguese lower secondary school grades.

abstract

The development of meaningful environments for the learning of Science and foreign languages at school is a concern for education, whose purpose should be, at a global level, also scientific literacy and language proficiency of students. Research on the integration of Science education with English learning as well as on the Language focus for Science education is thus highly relevant. Diverse languages are used within Science education, beyond the verbal, such as the visual, mathematical, operational languages through the Science doing, exploring, arguing, etc. and in meaning making for knowledge construction. Teachers are not always aware of the learning difficulty students may have with these languages, even when their mother tongue is the language of instruction. Previous studies have revealed that teaching practices aware of language and other semiotic modes implied in Science are beneficial for the learning of Science. CLIL (Content and Language Integrated Learning) is, actually, a possible educational approach, based on the principle that languages are learnt while they are used in socially significant activities, aiming both at the learners' understanding of content (a specific subject or part of it) and at the acquisition of an additional (foreign or second) language. Conceived for the students' acquisition of the foreign Language while in use during classes of the specific Content, CLIL is an example of cross-curricular education, entailing authentic learning settings and strategies more centred on learners. Furthermore, CLIL can represent a research context to gauge the importance of a language-aware teaching as in the case with the CLIL-type "English Plus" project (EP), in which Science is taught and learnt with and in English at lower secondary grades of one state school in North Portugal.
Our research questions were focused on the understanding of 1) the practices of Language(s) within Science education in the (EP) teachers' and students' experience and 2) the relationship between the presence of English and EP Science provision.

We designed a descriptive-explanatory case study of the EP project, in the 2015-2016 school year, embedding participants involved in the programme at different times and levels (two English and two Science teachers; 11 former and 96 current EP students, in relation to the year of our empirical study). Owing to the contextual conditions of the EP project, an ethnographic approach was undertaken, for the researcher to become familiar with it and its actors. We collected data from these different sources through a diversity of techniques: teacher and former student semi-structured interview; current student semi-structured questionnaire; non-structured "at-different-degree" participant observation of classroom practices, lesson planning and other contexts; collection of school and teacher documents. Inductive content analysis of transcribed interviews and open-ended answers to questionnaire was performed. A descriptive statistical analysis of closed-ended answers to student questionnaire as well as a reading of the researcher's field notes and school documents complemented the understanding, triangulating the information. Results brought independent evidence of a greater teacher awareness of the use of languages (verbal language in the mother tongue or English, and other representation modalities) when an additional language is also present for Science education. In other words, because of the presence of English, a (subject) teacher may become open to the student's (language) learning difficulties and learning styles and to changing strategies and resources. Therefore, besides the clear benefit of advancement in the English proficiency, a language-aware teaching methodology (also when the mother tongue is spoken) also emerges, important to improve the education of the specific subject and, consequently, student learning. In turn, this opens reflection on teacher practices and education for and about the learning of Science, and further opportunities for investigation. Our study increases the research on CLIL in Portugal and, among other contributions, enriches the field of study on CLIL and non-CLIL Science practice.

parole chiave

CLIL (Apprendimento Integrato di Lingua e Contenuto); educazione scientifica incentrata sul linguaggio; ILS (Inglese come Lingua Straniera); studio di caso; metodi qualitativi; scuola media inferiore portoghese.

sommario

Lo sviluppo di ambienti significativi per l'apprendimento delle Scienze e delle lingue straniere a scuola è un attuale interesse dell'educazione, che, a livello globale, si deve prefiggere anche l'alfabetismo scientifico e la conoscenza delle lingue negli alunni. È pertanto evidente la rilevanza di una ricerca sull'integrazione dell'apprendimento dell'Inglese nell'educazione in Scienze, così come sull'attenzione da rivolgere alla Lingua nell'educazione in Scienze. Oltre la lingua verbale, nell'educazione scientifica, si usa una varietà di linguaggi, come quello visuale, matematico, operazionale, attraverso il fare, l'esplorare, l'argomentare, ecc. tipici delle Scienze e nell'attribuzione di significato nel processo di costruzione della conoscenza. Gli insegnanti non sono sempre consapevoli delle difficoltà di apprendimento che gli studenti possono incontrare con queste lingue, pure quando il mezzo di istruzione è la lingua madre. Alcuni studi dimostrano che pratiche docenti consapevoli della lingua e di altre modalità semiotiche proprie delle Scienze sono vantaggiose per imparare le Scienze. Il CLIL (Apprendimento Integrato di Lingua e Contenuto, traduzione dell'inglese *Content and Language Integrated Learning*), di fatto, è un possibile approccio didattico, basato sul principio che le lingue si imparano quando si usano in attività socialmente pertinenti, affinché gli studenti comprendano il contenuto (una materia specifica o parte di essa) e acquisiscano la lingua (straniera o seconda). Pensato, appunto, per l'acquisizione della Lingua straniera mediante l'uso che se ne fa durante le lezioni di un determinato Contenuto, il CLIL è un esempio di didattica interdisciplinare, che prevede condizioni di apprendimento autentiche e strategie di insegnamento più centrate sull'alunno. Il CLIL, inoltre, può rappresentare un contesto di ricerca per stimare l'importanza di un insegnamento consapevole della lingua e del linguaggio, come nel caso del progetto "*English Plus*" (EP) con approccio tipo CLIL, in cui le Scienze sono insegnate e apprese con e in Inglese presso una scuola media pubblica nel Portogallo del Nord.
Le domande della nostra ricerca erano incentrate nella comprensione della 1) pratica di lingua e linguaggi nell'educazione in Scienze secondo l'esperienza di insegnanti e studenti del progetto EP e 2) relazione tra la presenza dell'Inglese e l'offerta del progetto EP di Scienze.

Abbiamo quindi pianificato uno studio di caso descrittivo-esplicativo sul progetto EP, nell'anno scolastico 2015-2016, inglobando i partecipanti coivolti nel programma in diversi momenti e a diversi livelli (due insegnanti di Inglese e due di Scienze; 11 ex alunni EP e 96 attuali, rispetto all'anno dello studio empirico). Tenuto conto delle condizioni contestuali del progetto EP, è stato intrapreso un approccio etnografico per consentire alla ricercatrice di familiarizzare con il contesto del progetto e gli attori in gioco. La raccolta dei dati è avvenuta da fonti differenti e tramite diverse tecniche: intervista semi-strutturata a docenti ed ex studenti; questionario semi-strutturato a studenti attuali; osservazione partecipante "con gradi differenti", non strutturata, delle pratiche in classe, della programmazione e di altri contesti; documenti della scuola e delle insegnanti. Abbiamo analizzato induttivamente il contenuto dei trascritti delle interviste e delle risposte aperte al questionario. Il processo conoscitivo è stato complementato con un'analisi statistica descrittiva delle risposte chiuse, così come con la lettura delle note di campo della ricercatrice e dei documenti, che hanno triangolato le informazioni.
Tra i risultati, esistono evidenze indipendenti di un'accresciuta consapevolezza nell'uso della lingua e dei linguaggi (linguaggio verbale nella lingua madre o in Inglese, e altre modalità di rappresentazione) quando un'altra lingua è presente per l'educazione in Scienze. In altre parole, per la presenza dell'Inglese, un docente (di disciplina) si apre più facilmente alle difficoltà di apprendimento (con la lingua) e agli stili di apprendimento degli alunni, e alla possibilità di cambiare strategie e risorse. Pertanto, oltre all'ovvio vantaggio nella conoscenza dell'Inglese, emerge anche una metodologia di insegnamento consapevole della lingua e dei linguaggi (anche quando è la lingua madre ad essere parlata), importante per migliorare la didattica della disciplina specifica e, di conseguenza, l'apprendimento dell'alunno. A sua volta, questo apre una riflessione sulla pratica docente e sulla formazione degli insegnanti a riguardo dell'apprendimento delle Scienze, e ulteriori opportunità di ricerca. Il nostro studio ha il merito di accrescere la ricerca in Portogallo in ambito CLIL, così come quello di arricchire il campo di studio sulla pratica CLIL e non CLIL di Scienze.

palabras claves

AICLE (Aprendizaje Integrado de Contenido y Lenguas Extranjeras); educación científica centrada en el lenguaje; ILE (Inglés como Lengua Extranjera); estudio de caso; métodos cualitativos; grado portugués de educación primaria.

resumen

El desarrollo de entornos significativos para el aprendizaje en las escuelas de las Ciencias y lenguas extranjeras es una preocupación presente en el terreno educativo y, a nivel global, la educación debería estar dirigida a la alfabetización científica y al conocimiento de idiomas en el alumnado. Por tanto, resulta muy relevante la investigación sobre la integración de la Educación en Ciencias y el aprendizaje de inglés, así como sobre un enfoque de la Lengua para la educación en Ciencias. En la educación científica se utilizan diversas lenguas, más allá del lenguaje meramente verbal, como los lenguajes visuales, matemáticos y operacionales, tanto a través de los géneros científicos (hacer, explorar, argumentar, etc.) como mediante la generación de significado para la construcción del conocimiento. El profesorado no siempre es consciente de las dificultades de aprendizaje que puedan tener los estudiantes con estos lenguajes, incluso cuando su lengua materna es el idioma de instrucción. Estudios anteriores han revelado que las prácticas de enseñanza consciente de la lengua, así como otros modos semióticos característicos de las Ciencias son beneficiosos para aprender las Ciencias. El AICLE (Aprendizaje Integrado de Contenido y Lenguas Extranjeras, en inglés, *Content and Language Integrated Learning*) es un posible enfoque educativo, basado en el principio de que los idiomas se aprenden mientras se utilizan en actividades socialmente relevantes, apuntando tanto a la comprensión del contenido por parte del estudiantado (un tema específico o parte de él) como a la adquisición de un idioma adicional (extranjero o secundario). Pensado para la adquisición de la Lengua extranjera que é usada durante las clases del Contenido específico, el AICLE es un ejemplo de educación inter-curricular, que implica entornos de aprendizaje auténticos y estrategias didácticas más centradas en el alumnado. Además, el AICLE puede representar un contexto de investigación para medir la importancia de una enseñanza consciente del la lengua, como en el caso del proyecto "*English Plus*" (EP, por sus siglas en inglés) con enfoque tipo AICLE, en el que las Ciencias se enseñan y aprenden con y en inglés en los grados inferiores de la educación secundaria de una escuela estatal del norte de Portugal.

Nuestras preguntas de investigación se centraron en la comprensión de 1) las prácticas de lengua y lenguajes dentro de la educación en Ciencias, según la experiencia del profesorado y estudiantado del proyecto EP; 2) la relación entre la presencia de inglés y la provisión del proyecto EP de Ciencias.

Para ello, diseñamos un estudio de caso descriptivo-explicativo sobre el proyecto EP durante el año escolar 2015-2016, integrando a las personas participantes involucradas en el programa en diferentes momentos y niveles (dos profesoras de inglés y dos de ciencias; 11 antiguos/as estudiantes de EP y 96 estudiantes del año escolar en curso cuando se realizó la investigación). Debido a las condiciones contextuales del proyecto EP, se tomó un enfoque etnográfico, de modo que la investigadora se familiarizase tanto con el contexto del programa como con sus actores. Se recolectaron datos de diferentes fuentes mediante técnicas diversas: entrevista semiestructurada de profesorado y ex alumnado; cuestionario semiestructurado al estudiantado actual; observación participante "con grados diferentes", no estructurada, de las prácticas en el aula, la planificación de lecciones y otros contextos; recolección de documentos escolares y docentes. Se realizó un análisis de contenido inductivo de las entrevistas transcritas y de las respuestas abiertas del cuestionario. El análisis estadístico descriptivo de las respuestas cerradas, así como la lectura de las notas de campo de la investigadora y los documentos de la escuela, triangularon los resultados y complementaron la comprensión.

Resultados diferentes evidenciaron de modo independiente una mayor conciencia del profesorado sobre el uso de lengua e lenguajes (lenguaje verbal en lengua materna o inglés, y otras modalidades de representación), cuando también está presente un idioma adicional en la educación en Ciencias. En otras palabras, debido a la presencia de inglés, un/a maestro/a puede abrirse a las dificultades de aprendizaje con la lengua del estudiantado, modificando para ello las estrategias y los recursos. Por tanto, además del claro beneficio del avance en el dominio de inglés, también emerge una metodología de enseñanza consciente de la lengua y de los lenguajes (también cuando se habla en la lengua materna), importante para mejorar la educación de una asignatura específica, mejorando asimismo el aprendizaje del alumnado. Esto, a su vez, abre una reflexión sobre las prácticas y la formación del profesorado, sobre el aprendizaje de Ciencias, entre otras oportunidades de investigación. Nuestro estudio aumenta la investigación sobre el AICLE en Portugal y, entre otras contribuciones, enriquece el campo de estudio sobre la práctica AICLE y no AICLE de Ciencias.

Contents

List of Figures*

* These figures have been constructed for the present thesis document. For those within the second chapter, see each published work.

List of Tables*

* These tables have been constructed for the present thesis document. For those within the second chapter, see each published work.

List of Appendices

Notation

CLIL,	Content and Language Integrated Learning
EBP,	*Ensino Bilingue Precoce*
EN,	English
EP,	"English Plus" project
DOCS,	data gathered through school documents
FL,	foreign language
sINTER,	data gathered through student interview
tINTER,	data gathered through teacher interview
LAC,	Language Across the Curriculum
L1,	mother tongue
L2,	second language
OBSV,	data gathered through class and other observation
PT,	project time (*hora de projeto*)
sQUEST,	data gathered through student questionnaire
SCI,	Science
UA,	University of Aveiro

Valentina Piacentini's ORCID

valentina.piacentini@ua.pt
valevale5@yahoo.it

Chapter 1: research prologue

1. Biographical Considerations

Valentina Piacentini has devoted her doctoral research to study the learning of Science (and modes for representing and communicating Science concepts and processes) through English (used and learnt besides traditional language classes), an objective that combines her professional background as a Science teacher and her interest in languages and cultures. After having studied 5 years of what is diffusely considered in Italy as the hardest course for high school, Classical Humanities (Italian, Latin, old Greek, Philosophy, etc.), she decided to take Biology at *La Sapienza* University in Rome, a choice which is not uncommon within the Italian education "mindset", since the acquisition of a study method through the logics of complex old languages as well as through a diversity of philosophical perspectives can function also to understand, construct and apply Science knowledge. Moreover, Italian high school is typically "generalist", at least compared to the Portuguese or Spanish ones: for instance, one learns Biology, Chemistry or Physics also in the Humanities. Therefore, Valentina undertook academic studies with a broad or, at least, a different point of view.

The experience she gained through the Erasmus Programme in Barcelona, in 2001, allowed for and reinforced a process of engagement with her own knowledge enhancement and integration of other learning possibilities (*charlas*, social volunteering or sharing with local families). In 2003, she graduated in Biology, with a thesis in molecular Biology (HIV infectivity). Nevertheless, it was not on a lab bench that she imagined to continuing her personal and professional research. Since then and until 2008, she had been involved in organisations and projects related to nature conservation and environmental education. It was the experience with groups within non-formal education on environmental issues and studies of nature as well as the coordination of youth work camps that made her see a path in Science education at school. Thus, in 2009, she completed her two year education (a post-graduation course) as a teacher of Maths and Science (6^{th}, 7^{th} and 8^{th} grades) and Biology, Chemistry and Geology (high school levels).

Her first contact with Portugal and the Portuguese education system occurred during the one year of Comenius Assistantship in the EPA (*Escola Profissional de Aveiro*) vocational school (2009-2010). During the following four years she worked as a teacher of Maths and Science in Italian lower secondary schools, also developing alternative and interesting activities using English or Spanish during classes of her specific disciplines. This teaching experience and the previous contact with Portugal brought, in September 2014, Valentina back to the academic environment, at the University of Aveiro, with a PhD project on CLIL (Content and Language Integrated Learning), involving different subject areas and requiring a diversity of perspectives, to submit to

the national funding institution (FCT, *Fundação para a Ciência e a Tecnologia*), granted a few months after through the SFRH/BD/102895/2014 fellowship. CIDTFF (*Centro de Investigação Didática e Tecnologia na Formação de Formadores* – Research Centre on Didactics and Technology in the Education of Trainers) and its articulated research fields in education seemed indeed to suit the integration of Content-Science and Language-English entailed in her inquiry, aimed at nurturing both the learning of English and education of Science. Similarly, being enrolled in the specific research field of *Didática e Desenvolvimento Curricular* (Didactics and Curricular Development) fulfiled the PhD student's concern to carry out a study on educational relationships, processes and actors.

As a member of this research centre, Valentina has been constantly connected with the educational area of Science research through publications and events associated with Science education and literacy – such as the STS (Science, Technology and Society) seminar in Aveiro (July '16) or the congress on research in Science education in Sevilla (September '17) – and lately within the *III Jornadas do LEduC* (3th Scientific Study Days of *Laboratório Aberto de Educação em Ciências* – Open Laboratory of Science Education) at her department, besides conferences for language promotion and education in general. Her regular collaboration with LALE (*Laboratório Aberto para a Aprendizagem de Línguas Estrangeiras* – Open Laboratory for the Learning of Foreign Languages) has found expression in workshops to foster awareness for linguistic and cultural diversity (at different school levels and through different learning contexts), the co-organisation of *IV Jornadas LALE* (4th LALE Scientific Study Days) or the evaluation of plurilingual and intercultural competences (*Kamishibai* 2018-2019 competition, etc.). Soon, the young researcher perceived the need for advancing her understanding to sustain the study on "Content and Language Integrated Learning", so she consulted experts on CLIL research and practice at Spanish universities (*Universitat Autònoma de Barcelona* and *Universidad Autónoma de Madrid*).

The core year of her empirical study, 2016, was a very productive one: publication and acceptance of papers, on different aspects of the project (cf. Piacentini, Simões, & Vieira, 2016, 2017); project design of an event directed to young researchers (submitted to the Gulbenkian foundation) and organisation of *I Caminhos de Investigação em Educação* – 1st Research Paths in Education, a seminar created for the research discussion and dissemination of at-different-stages results of Education PhD students; training course on CLIL to teachers of the school where the empirical study took place. At a personal level, Valentina became a mother of two girls, Zoe and Aria (December 23, 2016). Since her return to the PhD research from different kinds of leave, she has been involved – through the stages of data analysis, presentation and discussion of results, etc. –

in contexts and events revealing her commitment to Science Communication and Open Science (SCoRE|17, doctoral school of Science Communication for Researchers in Education leading, for example, to the infographic in Fig. 3; FameLab 2018, regional heat with "Who could help Science at school?"[1]; II CIDTFF Forum through the poster "*um Percurso de Abertura* – an Opening Path"; seminars on writing and communication styles; Research Summit '18 with the best pitch award in session II[2]; SciComPT '19 through poster presentation and market place; piece of "*H(À) Educação* in *Diário de Aveiro*, see appendix A; among others).

Since her arrival to the University of Aveiro (and even before) the PhD student has "embarked on the CLIL journey", in terms of the study of emergence and evolution in Europe, research and practice in different countries and preliminary projects and studies in Portugal, features of CLIL Science provision, contributing to (constructing and disseminating) knowledge on CLIL, both for the academic community (presentation at the first and second "Working CLIL" colloquium in Portugal, cf. Piacentini, Simões, & Vieira, 2018, 2019) and a wider one (organisation of seminars on the CLIL approach and the present inquiry for in-service and pre-service teachers, alongside leaflet design on CLIL references and resources). Hence, it appears clear that the potential of the CLIL universe for improving not only proficiency in the foreign language but also the understanding of the "languages" of/in Science education (cf. Piacentini, Simões, & Vieira, 2017, 2019) could also satisfy Valentina's personal and professional interests, determining parallel paths – linked to (Science and FL) educational research, (CLIL) teaching and classroom practices (cf. crucial dimensions of the Alarcão's *Tríptico da Didática*) – as described in the state of the art.

2. Research Problem

Science education has a pivotal role in the information society and for lifelong learning. As expressed by Martins, "*a ciência faz parte da cultura contemporânea e muito mais do que um corpo de conhecimentos, representa uma forma de pensar e de compreender*" (2014, p. 54). Unfortunately, disappointing results of worldwide monitoring studies such as PISA (Programme for International Student Assessment), among others, have shown a poor "transferability" of school Science knowledge into "comprehension" of everyday natural phenomena, giving rise to a "general debate on the need for a sufficient level of scientific literacy and the necessity to improve the quality of science instruction in school" (Duit, 2007, p. 3). Already two decades ago, Hurd noted that "science curricula need to be reinvented to harmonize with changes in the

[1] See https://www.youtube.com/watch?v=VHohuz1syLk&feature=youtu.be.
[2] See https://blogs.ua.pt/cidtff/?p=18918.

practice of science/technology, an information age, and the quality of life [but they are] descriptive, focused on the laws, theories, and concepts of presumably discrete disciplines" (1998, p. 411). Consistent with this, in 2013, "new orientations" in the Portuguese educational policy replaced national curriculum and its "essential competences", as well as high school syllabuses of sciences, with learning goals (*metas*) based on factual knowledge (Martins, 2014).

Contextualisation of Science education is fundamental to be significant for learners' lives and their cultural identities (Aikenhead, 2004) and to support them in distinguishing facts from myths, theories from dogmas, knowledge from opinion, evidence from propaganda, using some of Hurd's words (1998, p. 413). After all, a scientifically literate person is supposed to understand and integrate scientific information and take responsible decisions about socio-scientific issues (Holbrook & Rannikmae, 2009; Hurd, 1998; Martins, 2014; Roberts & Bybee, 2014; R. M. Vieira, Tenreiro-Vieira, & Martins, 2011), "creating and evolving ever-new forms of literacies that are suited […] to cope with the problems that arise from scientific and technological work" (Roth, 2007, p. 396). We consider that, for citizens to be informed and participate in real issues, individuals should be able to communicate adequately, collaboratively and effectively.

Assuming the perspective that "relates to the nature of science in a social setting and encompasses socio-scientific decision making", as delineated by Holbrook and Rannimkae, "a familiarity with language, or communication tools in general, can play a role […] to know how to extract and handle information" (2009, p. 282). We align also with an "overall" socio-cultural perspective of language learning[3], within which (multilingual) Science classes are defined as interactional social spaces with the spoken language (not necessarily a foreign system) being one resource used to construct a scientific explanation of natural phenomena (Ramos-de Robles & Espinet, 2013). Nevertheless, for many students the greatest difficulty is to learn the language(s) of Science (to be interpreted in a broader sense than just specialised languages of scientific fields, cf. Lemke, 2003, and drawing from the idea of a simultaneous process of "learning language" and "learning through language" in language development, cf. Halliday, 1993) and corresponding research has still to grow (Seah & Silver, 2018; Wellington & Osborne, 2001). Therefore, the relevance of giving a Language focus to formal Science education is clear.

On a different level, being competent in foreign languages (albeit to varying degrees) is also

[3] A social-semiotic theory of language as meaning-making activity (language use is shaped by what kind of activity we are doing and who we are doing it with), the Vygotskyan theory of learning in social interaction (language use with others is the essential mediating tool in our cognitive development), and a view of second language acquisition or development which gives due importance to its socially situated nature (cf. Llinares et al., 2012, pp. 10–13).

fundamental (Council of Europe, 2001; European Commission, 2003), not least for people participating in scientific and general discussion. Global demand for learning English and learning through English has been increasing (Dearden, 2014; Lin, 2016; Marsh, 2006). It is nowadays viewed as "global lingua franca" rather than "one of the foreign languages" (Smokotin, Alekseyenko, & Petrova, 2014, p. 512). English is the language of the international scientific community, as well as of technology and multimedia, useful for professional mobility and cultural encounters (Dearden, 2014; Gimeno, Seiz, de Siqueira, & Martínez, 2010; Kaire, 2017). English language skills have turned into a paramount competence at higher education (mainly for scientific degrees). Discussing about the strong role of English in the international Science research is sensible but not relevant within this work. Instead, we recognise the importance of its authentic learning and the significance of exploring factors of how the English language might support the learning of Science and vice versa. It is also relevant to identify and promote contexts at school that provide (inter)cultural opportunities with other languages (including the learners' mother tongue), where one's own culture is involved (Beleen & Jones, 2015; Fiedler, 2011; Jenkins, 2015; Smokotin et al., 2014), and that broaden the teacher and learner perspective of Science.

Owing to the presence of a foreign language, CLIL (Content and Language Integrated Learning, an educational approach particularly prolific in the European framework, practiced under many guises with the aim of the students' acquisition of both the FL and specific subject Content; see next section) represents a context for teachers to develop meaningful learning environments at school. English can be authentically used and learnt during Science classes; these, in turn, are implemented involving learners in their own development, who might thus recognise the use of what they learn along with subject education. For scholars, CLIL could serve as a context to gauge the importance for (Science) teachers of becoming language-aware, a quality advocated by researchers both inside and outside of the CLIL field: Coyle, Hood, & Marsh, 2010; Klein & Kirkpatrick, 2010; Lemke, 2003; Llinares, Morton, & Whittaker, 2012; Wellington & Osborne, 2001; Wolff, 2012.

For more than ten years, works mapping European CLIL initiatives at compulsory school levels contained no reference to Portugal (European Commission, 2006; Pérez-Cañado, 2012), but since then more and more projects have appeared (European Commission, 2017), even though they still represent isolated examples (Ellison, 2018) and corresponding research is mostly focused on the tertiary level, as shown in the following Box 1.

Box of Analysis – 1

When considering articles listed, until the 23rd of October of 2019, by the Portuguese "Working CLIL" research group[4] and related to studies on CLIL implemented in primary, secondary and higher education, more than 2/3 of them were focused on the latter. Also, with the exception of "the Case of the GoCLIL Project in Portugal" (Ellison & Santos, 2018), only studies of our group[5] have been devoted to lower secondary grades and our PhD inquiry continued and extended – in terms of both subject area and focus given also to learning – previous research on a school-led CLIL programme. On a different level, studies on CLIL did not emerge from a relatively recent publication reviewing research on the education of foreign languages in this country (F. Vieira, Moreira, & Peralta, 2014). It is also worth pointing out that, since almost 80% of teachers of specialist fields participanting in the "Working CLIL" colloquium (Porto, 2018)[6] were FL teachers, CLIL appears to belong mostly to the language area.

However, we consider that CLIL may provide to Science curriculum those literacy activities alluded by Pearson, Moje and Greenleaf: "Science learning entails and benefits from embedded literacy activities and […] literacy learning entails and benefits from being embedded within Science inquiry" (2010, p. 462), enhancing them. CLIL is, in fact, permeated by the concept of Language Across the Curriculum (LAC) that "acknowledges the fact that language education in school does *not only* take place in specific language subjects such as [L1, FL, L2, etc.] education, but also *in each and every other subject*, in each and every activity in school, across the whole curriculum" (Vollmer, 2007, p. 178). We align with deeming Science teacher also a teacher of language(s) (Wellington & Osborne, 2001), and with that "*seria un error creure que l'ensenyament daquesta capacitat [reading, for example] és només una responsabilitat del professorat de les diferentes llengües i que les altres disciplines [like Science] en són només usuàries*" (Sanmartí & Oliveras, 2011, p. 71).

The present study was not aimed at developing a research to improve Science education by itself or at understanding enhancement of the English language through CLIL; the purpose was rather investigating CLIL Science practice as a language-aware environment beneficial for Science education and conceptions on Science, where teacher strategies and classroom interactions could

[4] Acknowledging the recent growth of CLIL across school levels in Portugal and the role attributed to English as the academic lingua franca, the "Working CLIL" research strand of TEALS (Teacher Education and Applied Language Studies) at CETAPS (Centre for Translation and Anglo-Portuguese Studies) is committed to continuing teacher professional development and to examining the phenomenon in order to provide a strong research base in the national context (https://www.cetaps.com/clil/publications/ and Ellison, 2018).

[5] LALE, one of the CIDTFF's "extensions to community", has been the first Portuguese academic group in monitoring a school providing CLIL to 3rd cycle graders, since 2010 (cf. Simões et al., 2013).

[6] For further information, https://cetaps.wixsite.com/workingclil1.

be positively transformed, and having the expected "side effect" of higher proficiency in the foreign language. Therefore, CLIL (but also non-CLIL) Science classes – while English was used as the additional language[7] – and associated teaching methodology and learning processes were examined, in order to characterise one Portuguese "integrated learning" programme – the "English Plus" (EP) project – with its features and processes, and to understand the point of view of participants.

3. State of the Art

In this section, we describe different aspects of the CLIL research and practice, tracking a sort of evolution, diachronically and synchronically. Following diagram (Fig. 1) covers all sub-sections of the state of the art, being a simplified version of it and structured according to our knowledge.

[7] That is, English (with its features, patterns, contexts and skills to be developed) was the language (foreign, in the Portuguese context) used in meaning negotiation, collaborative communication and knowledge construction during Science classes, with no researcher attention on assessment of the language skills.

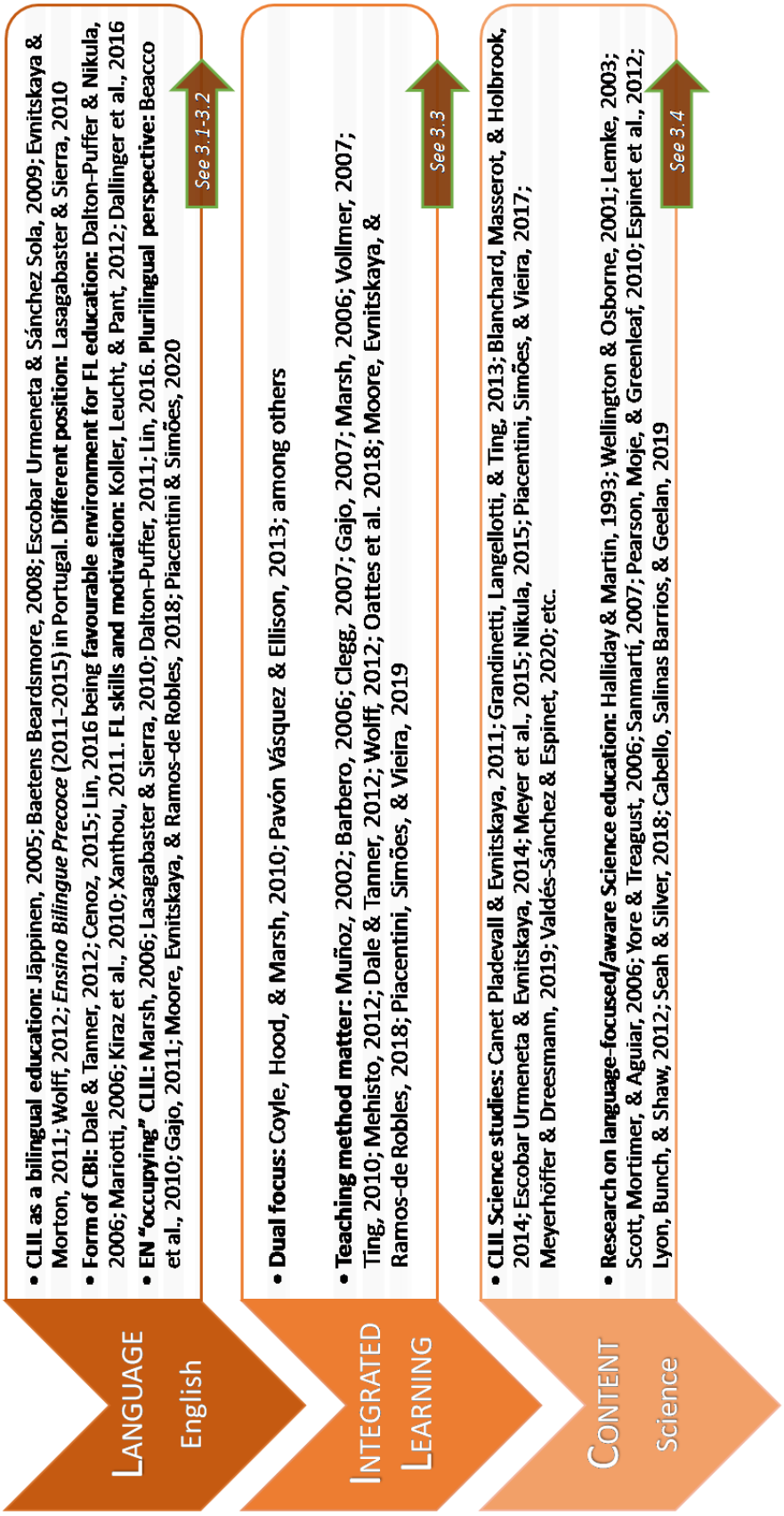


Figure 1: Language, Integrated Learning and Content (letters of the CLIL acronym revisited in order to organise sub-section content).

3.1 CLIL and a "new old" approach for the learning of foreign languages. Considerations on bilingual education

While theoretical underpinnings and methodological concerns of the "Content[8] and Language[9] Integrated Learning" (CLIL) methodology arose almost 50 years ago from immersion programmes of the bilingual education in the French speaking Canada, the term (in French, EMILE, *Enseignement d'une Matière par l'Intégration d'une Langue Etrangère*; in Spanish, AICLE, *Aprendizaje Integrado de Contenidos y Lenguas Estranjeras*) was coined by Maljers and Marsh only in 1994. This last author, an early reference for CLIL, described it as "any dual-focused educational context in which an additional language, thus not usually the first language of the learners involved, is used as a medium in the teaching and learning of non-language content" (2002, p. 2). In later works CLIL will be viewed as an umbrella term for "a wide range of educational practices and settings whose common denominator is that a non-L1 is used in [non-language] classes" (Dalton-Puffer, 2007, p. 2).

According to Lin (2016) CLIL is a type of content-based instruction (CBI, a broad category encompassing different programme models and curricular approaches, such as immersion, sheltered instruction, LAC and the CLIL itself, through which teachers and researchers have a common commitment to exploring and researching ways of helping the learning of language and content at the same time). In a more typically European research context, it is considered to share essential properties with CBI, different characteristics being due to historical and contextual factors rather than to different programme design principles (Cenoz, 2015). The main difference, pointed out by Dale and Tanner (2012) between CBLT (content-based language teaching) and CLIL, is that the former consists of teaching content in language lessons, whereas the latter consists of teaching a subject at the same time as teaching the language.

Especially during first decades, many authors have associated CLIL with bilingual education and immersive forms (e.g.: Baetens Beardsmore, 2008; Escobar Urmeneta & Sánchez Sola, 2009; Evnitskaya & Morton, 2011; Jäppinen, 2005; Wolff, 2012), which expose students to a language and promote its learning through teaching one or several non-linguistic subjects partly or completely in the L2 (Gajo, 2007). The association of CLIL practice with bilingual education is valid for countries with other official languages (Catalonia in Spain, the Italian Valle d'Aosta and Trentino Alto-Adige regions, the Belgian Flanders, etc.) or countries with minorities (Estonia,

[8] "Content" should be translated into Portuguese as *argumentos* or *temas* related to a specific curricular area rather than as *conteúdos.*

[9] By "language", it is meant one additional to the mainstream language of instruction, being either a foreign language (FL) or a second one (L2), chosen as the target CLIL language.

Sweden, etc.), where bilingualism is a reality and the CLIL language is the other state language or a minority one, respectively. Nevertheless, as remarked by Lasagabaster and Sierra (2010), differences from Canadian immersion have appeared over time in CLIL programmes, such as the "non-nativeness" of teachers and students, time of exposure and readapted (from those for native-language learners) or scaffolding (cognitive and interactive support for language difficulties) teaching materials. CLIL practice, in fact, does not imply that teachers are native speakers in the target language and does not aim at a bilingual-like learner proficiency. Also, within immersion programmes, no explicit attention is given to the language during subject lessons (Dale & Tanner, 2012).

In line with this rationale, we deem important to reconsider the concept of CLIL as understood in Portuguese pilot projects carried out in 2011-2015[10] (*Ensino Bilingue Precoce* – Early Bilingual Teaching) which diverges, at least nominally, from the perspective envisaging both a teaching and learning approach, non-bilingual expectations and implementation possible at any learning stage. Having said this, the CLIL contribution to advancing the learning of foreign languages is unquestioned. In the European context, it actually emerges as one solution through which European citizens can become competent in European languages besides their own (European Commission, 2003, 2011). Therefore, CLIL is acknowledged as a "change agent", in converting "monolingual learning contexts into bilingual experiences" and moving "towards a more equitable distribution of linguistic and social capital"(Coyle, 2013, pp. 244–245).

3.2 CLIL for language education: teaching approach, students' skills, target language(s) and changing perspective

CLIL is assumed as an alternative to Communicative Language Teaching (Coyle et al., 2010) or a way of extending it (Dalton-Puffer, 2007; Lasagabaster & Sierra, 2010). Arisen for the promotion of FL learning, the principle of CLIL, based on the 1982 Krashen's theory on Second Language Acquisition, is that students are exposed to the CLIL target language, at school, and learn how to speak while they authentically use it in and for the subject thematic learning. CLIL has, thus, been usually perceived as a favourable environment for the learning of foreign languages (e.g.: Dalton-Puffer & Nikula, 2006; Mariotti, 2006) and referred to as a "meaning-focused" and "content-enriched" method to improve the foreign language education (Kiraz et al., 2010; Xanthou, 2011). Diverse benefits exist for CLIL learners (Dale & Tanner, 2012), but students' attitudes and

[10] Further information about the EBP project can be found in the report associated with the link www.dge.mec.pt/sites/default/files/Projetos_Curriculares/Linguas/Ensino_Bilingue/documentos/relatorio_final_dezembro_2014.pdf.

motivation towards language learning, among other cognitive gains summarised by Pavón Vásquez and Ellison (2013), as well as foreign language skills (Dallinger, Jonkmann, Hollm, & Fiege, 2016; Koller, Leucht, & Pant, 2012) have been, indeed, shown to be boosted through CLIL.

CLIL projects and initiatives have been growing in the last decade, across school levels as well as at the tertiary level and in adult learning, also in countries (Cyprus, Denmark and Portugal) not identified before (European Commission, 2006, 2017). Different programmes and actions are listed, under the name of CLIL, in these European reports, so it is clear that CLIL is flexible and there is no formula for organising a CLIL programme nor template for planning CLIL lessons; it is the context and the subject that determines this (Coyle, 2005; Pavón Vázquez & Ellison, 2013). However, in the CLIL-4Cs Framework it is highlighted that the interrelationship between the 4Cs – Content as new knowledge and skills, with related Cultural and societal issues, through activities which provide Cognitive challenge[11]; at the same time, they Communicate and learn how to use the languages Of, For and Through learning[12]– may lead to effective CLIL (Coyle et al., 2010, pp. 53–56). While teachers and students are using the L2 as the medium of learning, they can also resort to their L1 resources in "translanguaging" practices (Lin & Lo, 2017), since the use of all languages in learners' repertoires is "a resource, rather than a hindrance, for constructing knowledge" (Moore, Evnitskaya, & Ramos-de Robles, 2018, p. 348).

In CLIL programmes, the choice of the target discipline may depend on the level of instruction and on its cognitive demands in terms of language itself. Even though any language can be selected, the adoption of English has been increasing and "taken up" CLIL implementation, in many countries and schools (Dalton-Puffer, 2011; Lasagabaster & Sierra, 2010; Lin, 2016; Marsh, 2006), leading Dalton-Puffer to rename CLIL as "CEIL", that is, Content and English Integrated Learning. In defiance of this, CLIL is indicated as one of the possible strategies to promote plurilingual and

[11] Potential fear from parents embarking on CLIL-like programmes for their children has been diluted through the illustrations of a few non-monolingual famous historical figures, scientists and creative writers by Baetens Beardsmore, who wrote that "there is no necessary handicap to creative thinking because of a multilingual background, on the contrary" (2008, p. 15). The "cognitive overload" of CLIL learners who have "to work harder when they learn through another language" may, actually, enhance understanding of subject concepts, thinking skills and likely creativity (Dale & Tanner, 2012, p. 11). As reinforced by Marsh, a CLIL provision may foster problem solving skills, metalinguistic awareness, and an overall higher mental flexibility, "linked to the management of two or more active language systems, and the experience of that management over time" (Marsh, 2012, p. 329).

[12] Language triptych (cf. Coyle): OF, specific subject language [key lexis and phrases, as well as grammatical structures and discourse functions associated with the theme (to define, to explain, to report, etc.), which the learner needs for knowing how to use thematic words]; FOR, general academic language students have to learn for operating effectively in a CLIL unit (to present a project, to work in groups, etc.), not varying from one subject to another one; THROUGH, not possible to foresee by the teacher but emerging when the learners neither have it nor possess the resources to produce it; important for recycling and extending the student's repertoire.

intercultural education (Beacco et al., 2010), since students happen to "learn about ideas and communicate with people from other cultures [and form] international perspectives on the subjects they are learning" (Dale & Tanner, 2012, p. 13). As noted by Piacentini and Simões (2020), the English learnt in a CLIL environment functions as a bridge to learn other languages and of other cultures – though plurilingualism should be assumed as a resource and a goal (Gajo, 2011) – and might provide a universal outlook in the study of disciplines like Science. Also, the "absorption of a utilitarian command of English through the new technologies" could enlarge motivation to learning through CLIL (Marsh, 2006, p. 35), when the target language is English.

3.3 The dual focus in CLIL-based education and benefit for specific curricular areas

This approach is doubtless "hard work" for both teachers and students (Bruton, 2013). Unlike traditional language classes, where the form and structure of a foreign language are the main object of study, within CLIL settings the mastery of Content (non-linguistic, specific subject which is represented and constructed through language) and the acquisition of the additional Language are a "dual focus" of both teaching and learning, according to referential conceptualisations of CLIL as an educational approach (e.g.: Coyle et al., 2010; Marsh, Mehisto, Wolff, & Frigols Martín, 2011; Pavón Vázquez & Ellison, 2013). The degree of collaboration between language and non-language teachers is somewhat constitutive in CLIL programmes, where they learn from each other and from an enhanced reflection on their pedagogical practice (Dale & Tanner, 2012; Muñoz, 2002; Pavón Vázquez & Ellison, 2013). Moreover, quality CLIL implementation is centred on learners because it may foster their autonomy and cooperative learning (through peer/group and project works), self and peer formative assessment, and it is based on intention and process visibility, also due to the cognitive demands of a given activity (Marsh, 2006; Mehisto, 2012; Ting, 2010; Wolff, 2012). CLIL classes require the development of a "language-supportive pedagogy" (Clegg, 2007) also through a diversity of teacher scaffolding strategies[13] (visualisation, for instance, reaches greater levels, cf. Marsh), and caters for a broad spectrum of multiple intelligences (Dale & Tanner, 2012).

[13] An overview of them is embedded in the tool published in Piacentini, Simões and Vieira (2017, p. 402, E. and F.), which also integrates the "types of scaffolding" developed by Tara Fortune with input from immersion teachers and based on ideas presented in *Making content comprehensible for English learners: The SIOP Model* (2nd ed., Boston, Pearson Education) by Echevarria, Vogt, and Short (2004). Examples of scaffolding are, at a verbal level, paraphrasing, reinforcing definitions, waiting for the answer, using corrective feedback techniques, developing questions gradually, use of rhymes, etc.; visually, the use of diagrams, word wall, videos, concept maps, etc.; modulating gazes, gestures, etc.; and practices as those already mentioned in the main text.

It is worth saying that, although "it takes time and effort to master the CLIL methodology and feel comfortable teaching in the second language", over time "the linguistic pressure is released" (Oattes, Oostdam, de Graaff, & Wilschut, 2018, p. 167) and CLIL can provide a positive learning context for non-language teachers. In fact, professional and personal challenges encountered using an additional language increase teacher awareness of learner linguistic needs (Blanchard, Masserot, & Holbrook, 2014; Marsh, 2012; Muñoz, 2002) and "may favour a more profound treatment of content" (Escobar Urmeneta & Evnitskaya, 2014, p. 178). Gajo has even stated that "the discourse opacity mainly due to the use of the L2 finally leads to the enhancement of subject knowledge and its density" (2007, p. 575), in offering an opportunity for dealing with content language aspects[14], otherwise not noticed (Moore et al., 2018). Hence, the presence of an additional language does not cause major difficulties in the implementation of CLIL classes; instead, the lack of appropriate methodology used in class does (Barbero, 2006). Contrarily, as expressed by Marsh, "changing the medium of instruction from one language to another in an educational context does not automatically qualify as an example [of CLIL]" (2006, p. 33).

In entailing "language-sensitive content teaching" strategies that prepare CLIL and non-CLIL teachers to work in CLIL-like contexts in European schools, CLIL is regarded as a "change agent"; because of the increasing migratory phenomena, conversational and academic competence levels[15] in the schooling language among learners are heterogeneous (Wolff, 2012). The adoption of the language awareness in CLIL posited by Piacentini, Simões and Vieira (2019) through CMIL (Content and Mother tongue Integrated Learning, that is, the CLIL approach also when the teacher's and students' native language is used), to improve the communication and understanding of specific subjects, might thus be meaningful. The policy envisaged in LAC, which is "linking different forms and aspects of language education within the school, particularly emphasising the role of language in all subject-matter learning" (Vollmer, 2007, p. 177), is clearly recalled here. Students not having sufficient time to apply what they have learned is indicated as the main constraint (Beacco et al., 2010; Coyle et al., 2010; Marsh & Langé, 2000; Milton &

[14] Through processes of conceptualisation/mediation (= paraphrasing, through useful descriptions) and clarification/remediation (= translation, to get to the right word), from the subject and language paradigms, respectively, and leading to the development of a new communicative competence which includes authentificating the language for mediating and remediating problems (of conceptual density and linguistic opacity, respectively) (cf. Gajo).

[15] BICS (Basic Interpersonal Communication Skills) and CALP (Cognitive Academic Language Proficiency) dimensions (cf. Cummins, 1987). The former are the communicative skills which almost all native speakers have; they are used in oral communication even though they can also be found in written form, for example in messenger communication. The latter, on the other hand, is the proficiency necessary to master the formal language registers, among others also the language of education or schooling.

Meara, 1998). Curriculum and policy constraints, as well as restrictive existing material, are other obstacles described by Coyle and her colleagues (2010). Also, the access to CLIL programmes might exclude certain students (Bruton, 2013).

3.4 Science education improvement. Science languages through CLIL towards scientific literacy

Studies focused more specifically on CLIL Science teaching and learning reveal that, when the Science teacher ends up working in CLIL settings, her/his "limitations" in the foreign language might lead her/him to make content more accessible to students and language more centred on them, as well as to a relationship less based on the teacher lecturing and less hierarchical with them (Blanchard et al., 2014; Grandinetti, Langellotti, & Ting, 2013; Piacentini, Simões, & Vieira, 2018). Subject CLIL teachers are engaged in "a constant process of rethinking the way one teaches", questioning their own teaching strategies and methodology (Canet Pladevall & Evnitskaya, 2011, p. 176), which facilitates Science learning and improve Science education and performance (Grandinetti et al., 2013; Jäppinen, 2005). In Europe, CLIL teachers are usually content teachers "challenged" by the additional language (Oattes et al., 2018) and whose language teacher role is different from the one of FL teachers, who can not support learners with (Science) genres and registers (Nikula, 2015) nor develop the language from the perspective of an non-linguistic subject (Gajo, 2007). On the other hand, Valdés-Sánchez and Espinet's studies (2020) show that a Science teacher sub-identity (cf. figure) is promoted in the FL teacher, within some CLIL programmes, by co-teaching the specific subject with Science teachers.

With regard to scientific literacy, as expounded on within the research problem and according to authors devoted to research on and advocating a language-focused Science education, "we teach *in* the languages of science[16], but we do not very often teach students *about* those languages" (Lemke, 2003, p. 11), which engage and empower learners. After all, "for many pupils the greatest obstacle in learning science – and also the most important achievement – is to learn its language [which is], in many ways, like learning a new language" (Wellington & Osborne, 2001, pp. 3–5). We should clarify that here it is implied that the language of communication is the mother tongue. Therefore, it seems that a CLIL environment, in being attentive to working on how to use language and how to learn to use it, represents a challenge and a context for Science teachers to

[16] From other works of the same author, opportunities for representing and communicating Science concepts and processes, through different languages: verbal (spoken and written), visual (graphs, tables, diagrams and drawings), mathematical (formulas, equations, calculations), kinaesthetic (action and observation to make sense within experimental procedures and operations), etc.

"embrace" also these Science languages, modes or representations[17] and to enrich them, with other verbal strategies and practical interventions (cf. Piacentini et al., 2017).

More awareness, actually, is required of teachers to understand the significance of the language demands in learning scientific topics, for students whose mother tongue is not the schooling language (Buxton & Lee, 2014; Cabello, Salinas Barrios, & Geelan, 2019; Lyon, Bunch, & Shaw, 2012; Seah & Silver, 2018), as much as in general (Halliday & Martin, 1993; Lemke, 2003; Wellington & Osborne, 2001). A deeper insight into the role of this representational diversity in developing Science knowledge and literacy is as crucial as orientating teacher education and professional practices (Tang, Delgado, & Moje, 2014; Yore & Treagust, 2006), so that the learning of the language and literacy practices become an essential part of the Science learning (Seah & Silver, 2018). In acknowledgement of the Vygotskian inextricable linkage between language development and conceptual development in social interaction, also Science must be taught/learnt to be "talked", read and written (Pearson et al., 2010; Sanmartí, 2007). The development of multimodality for Science knowledge and communication, both in the mother tongue and the foreign language, may be fostered by CLIL, if gradually and iteratively implemented (Meyer, Coyle, Halbach, Schuck, & Ting, 2015). Here, one should bear in mind that the role of language in Science education has been changing (Espinet, Izquierdo, Bonil, & Ramos-de Robles, 2012), from transmitting information to making sense of experience to participation in communities of practice, language being central in Science teaching and learning processes.

3.5 CLIL Science education also through the Portuguese school system

Further endeavour is necessary to understand how the construction of scientific knowledge develops through language and other modes of communication (Scott, Mortimer, & Aguiar, 2006). With regards to CLIL learning contexts, in which an additional language has to be learnt besides the mother tongue, research has focused on advantages for the students' foreign language skills and attitudes towards language learning, having shifted only recently to concerns related to content knowledge acquisition (Meyerhöffer & Dreesmann, 2019). Also, a greater collaboration between applied linguists and researchers in subject-specific education is sought

[17] In English, the differentiation between *línguas* (as in distinct foreign languages) and *linguagens* (as a particular semiotic modality or in the language of a particular field) is not possible, as opposed to Latin languages. In this respects, studies of Science education research are devoted to both "multiple representations" (representing to students the same concept through different forms) and "multimodality" (simultaneous use of different modalities within and across representations). Here, we do not differentiate them or discuss a "multirepresentational framework" like in other studies (Tang et al., 2014). Furthermore, multiple media or modes or semiotic systems are equally associated to the adjectives multimedia or multimodal (cf. Lemke).

(Nikula, Dalton-Puffer, & Llinares, 2013)[18]. Most studies in CLIL Science, in fact, originate from the Language research field, as evident in the following Box 2.

Box of Analysis – 2

At the end of October of 2019, within the results of a query for publications (articles, chapters, proceedings, etc.) in the Scopus and ERIC search engines, using CLIL, Science and school as (title, abstract and keywords) descriptors, we found 75 results in the last 15 years (Scopus) and 38 results in the last 20 (ERIC). Some of the items being covered by the two systems, we converged our attention on the Scopus search engine. Refinement was performed through excluding all publications not having Science as the or one actual specific subject to learn in compulsory school (26) or those related to graduate teacher education or preparation (7). The final 42 publications were issued by: 24 journals connected with language teaching, bilingual education or applied linguistics; 8 from general educational areas; 7 related to Science education; and 3 from other areas. This preliminary analysis only serves the purpose of understanding research fields devoted to CLIL Science. However, further endeavour is needed for identifying differences between primary-generalised and secondary-specialised education or European (typically monolingual) and non-European countries, as well as for characterising CLIL education in terms of teacher training, resource development, classroom practice, assessment, etc.

In Portugal, more specifically, little investigation has been conducted into the CLIL phenomenon, thus, "doors are wide open to further research through longitudinal studies […], case studies, as well as teacher-led action research [moreover] teacher education should [equip teachers] with skills and competences to investigate their own practice. Methods must now look beyond stakeholder satisfaction questionnaires to the effects of CLIL on learning in order to prove that it is not a risk to the education of a generation, but a worthy endeavour for all of those involved" (Ellison, 2018, p. 16).

In line with the last assertion, the present PhD study was aimed to continue a previous work on CLIL actors in Portugal (Simões, Pinho, Costa, & Costa, 2013), integrating points of view from students of different ages on learning and teaching processes through one CLIL approach (Piacentini et al., 2018), extending the interest and moving the focus to the field of Science education (Piacentini et al., 2016). On a different level, studies specifically directed at CLIL Science implementation have not paid attention, to our knowledge, to the "flux" – to be interpreted as relation rather than comparing – between the presence of English in CLIL Science conditions and Science teacher practices when the language of instruction is, typically, the mother tongue (non-

[18] Studies carried out by such a cross-curricular research team are still rare; examples are Bunch, Shaw, & Geaney, 2010; Espinet et al., 2017; Grandinetti et al., 2013; Meyer et al., 2015; Meyerhöffer & Dreesmann, 2019; Moore et al., 2018; Piacentini et al., 2016, 2017, 2018, 2019.

CLIL conditions). For these reasons, the main purpose of our research was to contribute to the understanding of the role of Language(s) in Science teaching and learning through the characterisation of both non-CLIL and CLIL practices (Piacentini et al., 2019), and to cultivate and supervise them through the proposal of an instrument that integrates them in a broader language focus (Piacentini et al., 2017). The context of study was one Portuguese state lower secondary school where a CLIL project (EP of History and Science with English, see the section on context) was being run.

Reflecting on language demands of (CLIL and non-CLIL) Science learning and on related teaching practices means, in our opinion, promoting teacher education in order "to equip CLIL teachers to bear the challenge of that [CLIL-mediated educational innovation] change" (Pérez Cañado, 2016, p. 217). It also means moving CLIL research forward, from investigating a context to increase proficiency in English towards one also supporting the teaching and learning of Science.

Seeing our work from the angle of the "many-faceted" CLIL research by Dalton-Puffer, it might be said that it is "geared more towards matters of content learning" and spots the quadrant of "process-oriented macro studies" (in giving a report on a CLIL implementation process in one institution) and of "product-oriented micro studies", though ours is not an outcome study, rather one highlighting different (non-interactional, strict meaning) aspects of teaching and learning within CLIL (2013, p. 72). Major domains of Science education research[19] internationally, identified by Duit in 2007, are: 1) analysis of content structure; 2) research on teaching and learning; 3) development and evaluation of instructional design; 4) research on curricular issues and education policies. Our study could be a contribution to the largest second domain for focusing on "student learning", "teaching" and "teachers' thinking and acting", also crossing and fueling the one of curricular decision for characterising "implementation, evaluation and dissemination of innovations introduced into the school system" (2007, pp. 8–9). In Fig. 2, the relationship of our inquiry (starting at the top) with theoretical frameworks is shown.

[19] Norwithstanding that the following is not the object of our inquiry, we should not forget to mention the attention of Science education researchers to the learning of Science language for English learners and within the home-classroom language gap that is indeed growing, delineating a commitment to questions with the potential to make new sense of the present and future. As today's globalised researchers and citizens, Cabello, Salinas Barrios and Geelan assert that "a vision of dialogue is critical to provide mutual understandings about our different ways of knowing and the forms in which they express in our contexts. We recognize that dialogue requires language, and science should be concerned with language for increasing dialogue" (2019, p. 950). Their special issue "Practitioner Learning in the Intersections between Science and Language" in the *Research in Science Education* journal is based on the fact that "teaching science becomes a matter not only of cognitive and procedural complexity but also of understanding and productively addressing the language differences that exist in a diverse classroom. These language differences entail cultural differences, which in turn makes for a more complex science education space" (2019, p. 952) and aims at giving a stronger voice to practitioners and their own insights into practices.

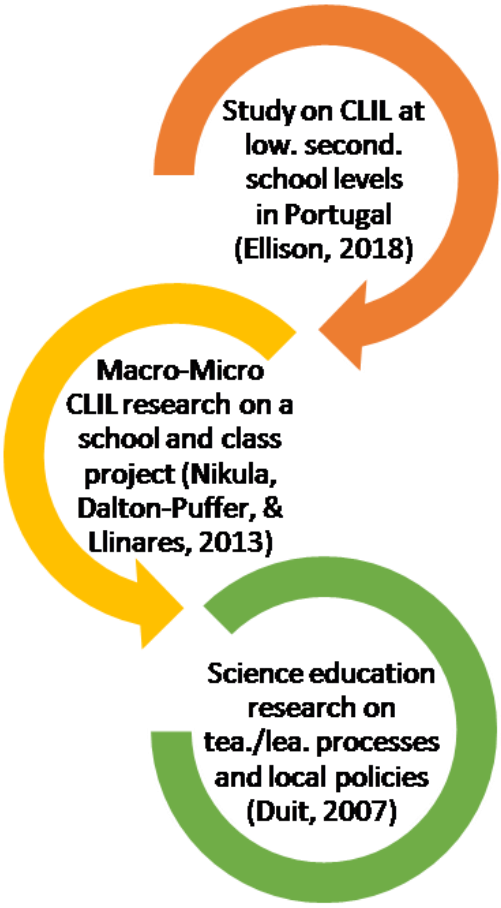


Figure 2: interrelated framing of the present study according to areas of referential literature.

4. Research Questions and Objectives

The submission of a project proposal for a FCT PhD fellowship – slightly revised within the project defense at the end of the first year of the doctoral programme – included a research question aimed at understanding connections between the typical practices of Science education (explanations, practical and experimental activities, representing concepts through visuals or models, etc.) and the use of English (informal discourse, features and patterns, academic language) for teachers to facilitate and improve the learning of Science together with English (*How can Science education and English practice be methodologically connected for an integrated learning?*). In order to pursue this, in the initial phase of the empirical study (carried out mainly in 2015-2016), the researcher was supposed to familiarise with the local context and school project, thereby started observing the school context and classroom practices, and collaborating with teachers (specific or general interventions in class or diverse moments of planning) to be accepted in the team and obtain permission to conduct the inquiry.

During the study, CLIL researchers/practitioners were consulted through visits of universities abroad (Barcelona and Madrid), where the need for a more structured and focused observation was also discussed. That research question was rephrased, so as to include the local context and also attempt to execute a class observation as in-depth as in some Spanish schools. The instrument mentioned above and that will be presented within the works and results was actually thought out for performing such observation of the Language use in/and Science learning in interaction. Nevertheless, the conduction of a systematic observation of both EP (project) and non-EP settings, and involving other teachers beyond the ones already participating, in Science classes was not viable (logistics of classrooms to be observed, timetables incompatible with the research), nor continuing the observation of classroom practices guided by the tool in the 2016-2017 school year (school difficulties in the EP project coordination, the researcher's pregnancy and maternity leaves).

However, the detection and support of the language implications "naturally" present in Science education (modes and representations, classroom discourse, language demands, genres and activities, etc.) became the focus of the analysis of data (gathered from participants at different levels in school practices that integrate Science with English) within the present research, as reflected in our research questions:

1) What practices of Language(s), within non-project Science education (when the mother tongue is used), are experienced by the "English Plus" Teachers and Students?
2) What relationship exists between the presence of a second language (English) and the Science teaching and learning through the CLIL-EP programme?

Preliminary evidence from independent results showed that teachers were more aware of making the language explicit and of working through multimodal strategies, when they used English during classes of the specific discipline within the project, therefore, the second question was fundamental.

Consideration of contextual conditions (organisational and pedagogical needs rising from the project implementation), rather than their transferability (implied in the other question presented at the project defense), as well as of the knowledge we gain through the actors of the process is pivotal for reflecting on quality CLIL practice together with interested teachers. Recommendations (orientations) will emerge through the answers to the research questions and other final remarks. Moreover, due to the specificity of this CLIL project (bottom-up teacher initiative, lower secondary grades, co-teaching of History and Science with English, etc., see 6.2), we decided not to add a research question about project macro regulation (*How is a project of "integrated*

learning" in Science and English regulated and provided within the framework of one middle school?), and school documents were interpreted merely to complement the findings achieved through main data sources (section 5.4.5.2). The characterisation of the profile of participants in relation to Languages, Science and the teaching/learning of specific subjects with a foreign language in/and the school context of the project is, indeed, a necessary step in case study research like ours, not requiring a further question.

Research objectives were developed to cover the needs and aspects of knowledge construction linked to this study.

a. To review literature for a comprehensive overview of European CLIL provision, CLIL Science studies conducted at compulsory school levels as well as non-CLIL Science research devoted to language demands and subject representation;
b. To describe the Portuguese CLIL-EP project case, in terms of: national and local context, emergence and evolution, actors, organisational features, educational and other considerations;
c. To characterise the profile of teachers and (older or former and younger or current) students participant in the "English Plus" project, including knowledge of and relationship with English and Science and learning experience/expectations with the CLIL approach used in the project;
d. To identify teaching practices (spoken by teachers and students, observed by the researcher, reported in documents) of "Science languages", within non-CLIL and CLIL-EP settings (where the mother tongue and English are used, respectively);
e. To understand difficulties that students experience in the learning of Science, teaching strategies to overcome them as well as the influence of the project on them;
f. To identify contexts of everyday life with an authentic exposure to Science with English whose use may facilitate planning/implementation of CLIL Science classes with English;
g. To develop an instrument that could support the (planning and evaluation of the) use of a language focus in Science education, speaking either English or Portuguese.

5. Research Methods

Research methods are overviewed in Tab. 1 and described in details in this section. For the ethical considerations and trustworthiness criteria of the present study (not shown in this table), see sections 5.5 and 5.6, respectively.

Table 1: content of the research method section.

Paradigm 5.1	**Design 5.2**	**Data collection**	**Data analysis**
Socio-constructivism	Instrumental case study	Teacher interview 5.3.1; 5.4.1 Former student interview 5.3.2; 5.4.1	Verbatim transcription Inductive content analysis 5.4.2
Emic perspective	Ethnographic approach		
Open Science	Triangulation of sources and methods	Current student questionnaire 5.3.3; 5.4.3	Inductive content analysis Descriptive statistical analysis 5.4.4
		Observation of practices 5.4.5.1	Revision
		Collection of documents 5.4.5.2	Revision

5.1 Claim of Knowledge

As stated by Creswell, "researchers make claims about what is knowledge (ontology), how we know it (epistemology), what values go into it (axiology), how we write about it (rhetoric), and the process for studying it (methodology)" (2003, p. 6). In responding to the ontological, epistemological and methodological questions (Guba & Lincoln, 1994, p. 108), basic beliefs defining the inquiry paradigm or knowledge claim of our research are aligned with a naturalistic or constructivist (Guba & Lincoln, 1994), social constructivist (Lodico, Spaulding, & Voegtle, 2006) interpretive (Cohen, Manion, & Morrison, 2000) framework, ontological/epistemological assumptions being constructed within the world where understanding is sought (Bryman, 2012; Creswell, 2003; Guba & Lincoln, 1994; Lodico et al., 2006).

World perception changes according to our age, state, education, socio-cultural backgrounds, human relations; using Guba & Lincoln's words, "social realities […] products of human intellects […] may change as their constructors become more informed and sophisticated" (1994, p. 111). Thereby there is not an objective social reality that we can capture, as researchers, since we construct reality in accord with our personal experiences and considering multiple perspectives of participants involved (Lodico et al., 2006), the "emic" viewpoint, without imposing preconceived categories or theoretical perspectives (Hsieh & Shannon, 2005). The researcher and her/his object of study are interwoven so that reality is the interpretation (investigation) that we make of (on) it (Guba & Lincoln, 1994). Also researchers devoted to mixed methods, such as Johnson and Onwuegbuzie, argue that "the conduct of fully objective and value-free research is a myth [within

post-positivists claims], even though the regulatory ideal of objectivity can be a useful one" (2004, p. 16).

Our research was focused on Science education and English learning, and on their convergence within the CLIL "English Plus" project, that is, specific learning settings to develop both subject knowledge and language acquisition. Hence, we were interested in understanding educational processes and/in its naturalistic conditions, which is a reality constantly changing, involving human beings, relations and meanings. We could not "control" the complex phenomenon of teaching practices breaking it into reductive parts to relate a cause to its effects. Instead, knowledge was generated gathering and interpreting information from individuals, their interactions and through their vision, by means of inductive reasoning, in a context where the researcher was "immersed", as detailed in the next section. Debating with participant teachers about strategies developed in class as well as the sharing of resources and information during and after the study may have provoked a transformation in their perceptions and practices in education, nevertheless we did not assume an explicit commitment to advocacy/participatory perspectives.

Notwithstanding the fact that "both qualitative and quantitative methods may be used appropriately with any research paradigm" (Guba & Lincoln, 1994, p. 105), our epistemological position has led to research questions "driving" an approach in method design with a predominantly qualitative nature. The understanding of the teachers' opinion in relation to educational methods or classroom practices, as well as the students' point of view on the experience with and expectation on the integrated learning, required inductive processes, searching for patterns or themes in interviews or observations and drawing conclusions from interpreting analysed data. Moreover, the discussion of aspects featuring the local EP project, Science classes and CLIL practice in Portugal, emerging from the empirical study, engaged participant teachers in multifaceted manners (individual interviews, suggestions for interventions, pedagogical conversations, interview text validation, seminar for the school).

As described in sections pertaining to instruments (5.4.1 and 5.4.3), we used a student questionnaire aimed at achieving descriptive and numerical data, treating both of them qualitatively for a holistic understanding. We also developed a tool for a (more) structured and objective observation of CLIL Science classroom practices (cf. Piacentini et al., 2017) as much as regulatory strategies (cf. Tab. 2) were taken into account in the data collection and analysis to attempt to minimise the "innate invalidity" in (qualitative) research practices (Lopes, Pedrosa-de-Jesus, & Watts, 2016). Collaborative construction, together with teachers, of the instrument

employed on students (the interview guide and, to some extent, the questionnaire) took place, which is an approach to research that can help people achieve changes (Lodico et al., 2006). From the angle of rhetoric, besides the typically academic dissemination of findings, we "Opened our Science" through participation in events and creation of material, using a (writing and speaking) style transparent and accessible to people we work with and for, teachers and students (cf. Fig. 3 or appendix A). Furthermore, since our study is grounded in the Portuguese school system, natural language used by participant teachers and students (Portuguese) will not be translated in this section of methods, in the following context characterisation as well as within results in the final chapter.

5.2 Research Design: a case study

Although our work was characterised by personal involvement in school activities, ranging from intervention to supervision, researcher did not belong to the specific school community. The present inquiry was not determined by a problematic situation arising in the specific context, in fact, target school was selected because one project of integrated learning ("English Plus" of History) had been already implemented (Simões et al., 2013) and Science curriculum articulated with English was being provided at the time of our empirical study. This means that the school institution was not randomly sampled; in contrast, project teachers showed availability to collaborate again with our research centre and the school was relatively easy to access. Therefore, the problem (including teaching strategies for quality learning of the specific subject, authentic learning of foreign languages, non-compartmental education) framed in this study represented a general educational concern rather than a practical one.

That said, the ideal design for answering our research questions was a case study, that is, "an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" (Yin, 1994, p. 13). The curricular integration of Science and English could not actually be disjointed from contextual conditions of this project and its participants. The case had, thus, its "uniqueness" (Stake, 1994). However, it was not undertaken because of an intrinsic interest in the "English Plus" programme, rather we chose and examined this particular case because it could "instrumentally" provide insight into the language(s) used within the discipline of Science and how the English presence could affect them. In representing other cases, the case played a "supportive role [helping] us pursue the external interest" (Stake, 1994, p. 237).

Using Yin's terminology (1994), our strategy of inquiry constituted a descriptive case study attempting also to explain the reasons for the phenomenon described (integration project and educational processes), and it was designed as a single case, with the following boundaries:

1. object, the articulation of Science education with the use/learning of English;
2. context, teaching practices within the CLIL EP project (planning of and co-taught Science classes plus "project time" of English on Science topics) as well as those of non-project Science classes;
3. place, lower secondary grades (7^{th} and 8^{th} groups) of a state-run school officially collaborating with our university;
4. time, the 2015-2016 school year.

Teachers and students associated with the EP project at different times and levels were "embedded" as subunits of analysis. Actually, teachers' practices (spoken and observed) and the learner's opinion and feedback gave "significant opportunities [for] enhancing the insights into the single case" (Yin, 1994, p. 44) and "a variety of lenses which allows […] the phenomenon to be revealed and understood" (Baxter & Jack, 2008, p. 544), complemented by reading specific school documents.

Moving from this scale-of-particular to a larger (holistic) one, our case study was noted – during a research intership on CLIL in Barcelona in April 2016 supervised by Cristina Escobar Urmeneta and Natalia Evnitskaya – to have an ethnographic approach, a combination being possible in agreement with White, Crew and Hay (2009). This also accounts for the inquiry modification portrayed in the section on questions, ethnographic studies presenting a research-context interaction (Suryani, 2008). On a different level, as an ethnographer/philosopher, the researcher was "continually questioning the grounds of the conventional […] so taken-for-granted […] that it becomes invisible" (Erickson, 1984, p. 10). In being an "cultural outsider" (an Italian teacher and a PhD researcher) needing to become acquainted with a new context (the school, its actors and rules, at a national and local level) and an ongoing project (EP, with its history, organisation and participants), beyond interview conduction or questionnaire administration, the researcher participated extensively, indeed, in the project and school activities, diversifying her role and action along the empirical study, while performing observation for an extended length of time.

During the first months, her intervention was requested to be more participant (*covert*), in order to be accepted by project teachers and their students as a "member of the group" and to be able to "access" the natural EP universe. During one meeting a teacher, actually, declared that it would be a sort of exchange, so (and for the purpose of research) the researcher implemented CLIL

Science classes herself, participated in some planning sessions, collaborating with teachers in resource development and test design, listening to and advising them. In the last school term – back from visiting CLIL research centres abroad and having developed a specific instrument – she became more observant (*overt*), narrowing the focus on Science classes and the presence of English as well as on possible differences from standard practices in teaching strategies. It is worth saying that, after a few months, the teacher who initially expected a member-like involvement from the researcher, introduced her as a partner in a different school context.

The researcher had been seen as "the English expert with Science knowledge" in both EP and practical Science classes and as "the Science teacher with English experience" in the PT classes and in some planning sessions. She also discussed, within the research internship abroad, the doubts teachers had about the CLIL approach, supported the organisation of study visits and was asked for contributing to the 2015-2016 report on the "English Plus" of Science and more. In this document teachers described her as a collaborator in the "teaching Science through English" process[20]. Furthermore, she was one of the trainers of a seminar on CLIL at school specifically planned for interested teachers. Throughout the research time, in both that school year and years following the actual study, the inquirer shared with teachers evidence from literature and ongoing findings (result drafts, framework, interview transcriptions, infographic), events related to CLIL teacher education as well as resources useful for teaching within CLIL.

The direct unstructured observation (originating field notes), more regularly carried out during approximately one school year, is viewed as a data collection technique typical of ethnographies (Bryman, 2012; Flick, 2009), though "at-different-degree" participant observation is thought of also as an approach of qualitative case studies (Cohen et al., 2000; Willis, 2007). With respect to other features such as authentic settings, ethical considerations and existence of biases, more consensus between authors exists on the two types of strategies of inquiry.

Since observations and interpretations are not perfectly repeatable, case researchers need to collect data through diverse as well as redundant procedures, known as triangulation, "a process of using multiple perceptions to clarify meaning, verifying the repeatability of an observation or interpretation" (Stake, 1994, p. 241). Findings were triangulated through multiple sources and

[20] Here, the words used by teachers: *este elemento da UA foi considerado como uma mais-valia, quer pela troca de ideias e conhecimentos, quer pela reflexão realizada conjuntamente com as professoras, especialmente ao nível das experiências de aprendizagem e de materiais específicos. Colaborou no decorrer do processo "teaching Science through English" através da observação das estratégias utilizadas durante as aulas (vocabulário, conceitos e linguagem científica, análise de questões, desafios e procedimentos experimentais), tendo estabelecido uma boa interação com alunos e docentes*.

methods, to validate gathered data (cf. Tab. 2), developing the most credible interpretation. Indeed, according to the constructivist perspective of some case researchers, there is not a single and fixed version of knowledge, the author presents her/his personal meanings of events and relationships to readers who, in turn, reconstruct the knowledge in a personal manner (Stake, 1994), and descriptions should be in-depth so that the author's conclusion makes sense to the reader (Merriam, 1995).

To conclude, we perceive the exploratory function of research designed as a case study, however we align with Tsang who rebuts the "assumption" that case studies only have an exploratory nature and lack of generalisability, contending that "case study results may be less generalizable than those of quantitative methods only within the population from which the case or cases are selected [but case studies have merits over quantitative methods] in terms of generalizing to theory, identifying disconfirming cases [falsification], and providing useful information for assessing the [cross-population] empirical generalizability of results[21]" (2014, p. 379). Having said that, along with discussing about generalisability, we defend the importance of assessing the rigour of field research through a diversity of criteria, as one can examine through the overview at the end of this section on methods (Tab. 2).

5.3 Participants

As said above, the researcher did not choose the school of the "English Plus" project and its members on the basis of inclusion criteria (if excluding reasons of feasibility, detailed within the context characterization in 6.2) or considering whether selected subjects represented the entire population or not, the goal of our study not being the statistical extrapolation of participant viewpoints. If at all, the school was representative (convenience or non-random sampling) of established "integrated learning" programmes of Science classes taught with both English (project) and Portuguese (non-project).

5.3.1 Teachers

Participant teachers were all the teachers involved in the "English Plus" project in the year of our study: two Science (Sci-new and Sci-old) and two English (Eng-new and Eng-old) teachers. At the beginning of the 2015-2016 school year, they all had a working experience of longer than 20 years. The Natural Science teacher of the two 7th grade EP classes, Sci-new, was in her first year of the project (and back to this school level after having worked, for the last 15 years, with high school students), whereas the teacher of the two 8th grade and one 9th grade EP classes, Sci-old,

[21] Cross-population empirical generalisation as opposed to statistical empirical one.

had already had two years' experience with the EP project of Science. The English teacher of these five classes (current students, see 5.3.2), Eng-old, had played a pivotal role in the programme evolution: she introduced and developed the first EP edition in History (in 2010-2013, with former students, see 5.3.3), sought for a collaboration with our research centre and reactivated the project in 2014-2015 for the Natural Sciences, involving one Science teacher (Sci-old) and, since 2015-2016, coordinating a new school-university collaboration within our PhD research. She also "tutored" another English colleague (Eng-new), who had her own EP class in 2016-2017.

It is worth pointing out that the Science teachers learnt English mainly in private institutes and used to practice it (reading papers, going to conferences, etc.) during their degrees in Biology; the English teachers studied Science until the 9th grade. Sci-old also happened to be involved in one previous edition of the French section. EP teachers used to co-teach and co-plan classes of theoretical Natural Science with English, as described in the context and results sections below. At the end of 2014-2015 the researcher and her supervisor met Eng-old and Sci-old as well as their principal at school. At the beginning of 2015-2016, also with the aim of achieving familiarisation with the "English Plus" teachers and project context, we interviewed the four EP teachers (in a meeting room at school before the start of the year, during approximately one hour each).

5.3.2 Former students

Older students were selected for being former EP students, that is, terminal high school learners (12th grade) who had had EP of History in 2010-2013 (when they were 7th, 8th and 9th graders at lower secondary school; "former", relatively to the year of the study, 2015-2016). In the section of context characterisation (6.2), further information on the "English Plus" project attended by students can be found. Their History teacher in the first two years was Portuguese-South African, hence an English native speaker, whereas the teacher substituting in the last year was Portuguese with a clearly lower English proficiency, as emerged during the student interview and confirmed by teachers themselves. The English teacher they had during the EP project (Eng-old) was also the one of English in high school, and the Science teacher they had in high school happened to work with current EP students at 7th grade in 2015-2016 (Sci-new).

Talks with Eng-old clarified the potential of interviewing ex-EP students and allowed for the selection of 11 students with the following characteristics: distributed among high school fields roughly in proportion to those of all 26 students from the 2010-2013 EP class in the last year of the project; being heterogeneous in terms of performance at the previous school level; being all capable of reflecting on their own learning process. Our sample (from a total of 26 students, 14 in Science, 8 in Economics and 4 in Humanities) was, thus, comprised of 6 students from Science –

fsSci_1, fsSci_2, fsSci_3, fsSci_6, fsSci_7 and fsSci_11 –, 4 from Economics – fsEcn_4, fsEcn_5, fsEcn_8 and fsEcn_9 –, and one from Humanities, fsHum_10 (codes used in transcripts and results). Taking into account the maturity and small number of them, we conducted interviews at the end of 2015-2016, over three days, at school (bar, meeting room or empty classrooms) during gaps they had from lessons; the interview length ranged from 12 to 25 minutes.

5.3.3 Current students

These students were "conveniently" selected for being current EP students, that is, lower secondary school learners provided with EP of Science in the year of the study ("current", relatively to the year of the study). As detailed within the local context (section 6.2), they weekly had 45 minutes of Science co-taught by the Science and English teachers using English; 45 minutes of same subject given by the Science teacher alone, who could choose Portuguese or English; and 45 of English on socio-cultural subject-related topics only with the English teacher. Five "English Plus" classes existed in 2015-2016 (two 7th, two 8th and one 9th grades). Teachers suggested the exclusion of the 9th graders from the study, their experience with the project having not been regular. Current students were thus 44 seventh graders (average age, 12) in their first year of the project and 52 eight graders (average age, 13) in their second year; no code was associated to them. Because of the large number of students (N = 96), we designed a semi-structured questionnaire. Aimed at facilitating the students' answers collection and treatment, the instrument was administered online through a form with an engaging layout (cf. appendix D), at the end of the first term of the 2015-2016 school year; for further details, see 5.4.3.1 and 5.4.3.2.

5. 4 Procedures

In this section, each method of data collection (interview and questionnaire) is described and followed by analysis and validation (treatment) carried out. Secondary methods are also presented at the end.

5.4.1 Data collection through interview (tINTER and sINTER)

Since the PhD student was competent in the mother tongue of her research subjects, Portuguese was used during interviews, enabling the participants' building up of rapport with and open up to the researcher (E. W. K. Tsang, 1998). She introduced herself, the purpose of the inquiry and methods to be used and showed her bond with the school project throughout the whole interview, to have an atmosphere more conducive to the interviewer-interviewee flow and information gathering.

In the case of teachers, two semi-structured interview guides were developed (tINTER; for questions and objectives, see appendix B), one for the Science teachers and one for the English

ones, diverging only in the items aimed at characterising the learning experience with Science and the knowledge of foreign languages (for the English and Science teachers, respectively) and their vision on cultural implications of English and Science. As shown in the table of the appendix, competence areas drawn from the CLIL Teacher's competences Grid (Bertaux, Coonan, Frigols-Martín, & Mehisto, 2010) were also associated to each question. The first part of the guide contained questions regarding (i) the interviewee's education and work as a teacher, (ii and iii) their linguistic/scientific profile, (iv) strategies and resources used in classroom practices and (v) socio-cultural implications of the subject they teach, as well as (vi) questions linking Science with (foreign) languages (position about Science teacher also being a Language teacher; relationship between Science and English at school). The second group of questions referred to (vii) knowledge and/or experiences they have with the CLIL approach of the EP project, at an organisational and educational level. In order to validate the question content in terms of clearness and effectiveness and the interviewing process itself, young researchers with teaching experience were interviewed first at our department. Major changes had to do with giving some examples to clarify the meaning and, sometimes, the purpose of questions.

After the researcher had inquired of EP teachers and younger students (see below) and observed EP Science classes during almost two terms of the 2015-2016 school year, getting informed about the "English Plus" project mainly through teachers' voices, a further semi-structured interview guide (sINTER; for questions and objectives, see appendix C) was constructed, together with Eng-old, in order to understand: (i) the older learner's opinion about the EP project; (ii) difficulties encountered and how they were overcome as well as suggestions for current EP students; (iii) subject benefitting from the combination of History education with English learning; (iv) differences between co-teaching and single-teaching (cf. context in 6.2); (v) situations in which the use of English could have facilitated the learning process compared to Portuguese; (vi) possible benefits for the study of Science at high school; (vii) learning of English and desire to know other languages and cultures. The (v) point was taken into account, owing to preliminary evidence that some project students found English easier than Portuguese (teacher interview and practice observation). The (vi) one arose from the the need for knowing a possible relationship between having attended the project in lower secondary grades and the study of scientific disciplines at high school.

5.4.2 Interview data treatment

Audio-recorded interviews were transcribed, following a transcription convention (Appendix E) and the new Portuguese *Acordo Ortográfico*, through the open source oTranscribe application,

which facilitated the use of commands on an audio file with the typing process itself. We shared transcription with each teacher for checking data truthfulness, but no feedback was given (except for a few suggestions of grammatical order or one reminder that feedback would be provided) in a time span of almost four months (from beginning of June until the middle of October). It probably represented what Martin Tolich said within a workshop for UA PhD students in Education, a "burden" (on both participants and researchers) on the already busy working rhythm observed in teachers. Because high school students were interviewed at the end of the school year, researcher did not manage the interview transcription and sharing with them on time, before they had completed their last year at school and started university. However, in order to achieve plausible information, she repeated or reformulated questions not clear to both teachers and students and made sure of having understood (asking for clarification, interpreting with her own words, etc.), as evident in different moments of the interviews. Transcribed interviews are provided within the appendices (F, full text of the 4 EP teachers, and G, "collective" subject for former students).

Qualitative content analysis procedures (Hsieh & Shannon, 2005; Mayring, 2014) were performed on verbatim transcripts. Since existing literature on the "English Plus" project was limited, we decided to perform an inductive categorisation (Mayring, 2014), hence, fields emerged from participants to enable the researcher to gain a richer understanding of the phenomenon (Hsieh & Shannon, 2005). Immersive data reading allowed for obtaining a sense of the whole (at the beginning, an annotated document was developed) and coding process (mediated, at least in an initial stage, by the Atlas.Ti 6 software) for reducing large quantities of the interview text into much fewer content categories. We considered, as a unit of analysis, an utterance or argument (or more than one) contributing to a specific question/concept; we also clustered answers to different questions when providing evidence for the same concept. One should intend "coding" as the association of interviewees' quotes with key thoughts or concepts that were already present in the text or derived from translating them during the analysis of content. This resulted in a scheme of codes, which were then grouped into categories, that is, patterns or themes linking related codes or directly disclosed in the interviews. We outlined the coding schemes and defined categories that could guide coders/readers to make/check decisions in the organisation of quotes (data) into categories (cf., for instance, appendix H).

Teachers' coded responses – such as to questions connected with the CLIL approach of the "English Plus" project (experience with CLIL implementation, assessment of modules using CLIL, responsibilities and requirements of a CLIL teacher, possible extra work in being a CLIL teacher) –

were cohesive with constituted fields of the teacher professional practice (in-service education, planning, implementation and assessment), or could be organised through them, this being a form of validation. Science representational forms (cf. Piacentini et al., 2019) were reviewed through several paper submissions, examined by one peer expert in questioning within Science education and, at least preliminary evidence of them, discussed with the project teachers during the empirical study. Interpreting this categorisation also allowed for the classification of sub-categories in terms of the range of "languages" within Science education[22], both in conventional and project classes (with Portuguese and English being spoken, respectively). An example of the analysis of data from these interviewees can be consulted in the appendix of the above-mentioned article.

In the case of former students, we organised inductive coding of the answers that they gave, for instance, to questions n. 1+3 and 5 through the letters of the CLIL acronym and "grammatical reasons"[23], respectively. In general, categories were discussed with supervisors and colleagues in related areas and refined also through the communication of results at an oral level (a presentation in one EDiLiC congress and a poster in the CLIL colloquium) and the peer-reviewing process for publishing (cf. Piacentini et al., 2018; Piacentini & Simões, 2020). Within the appendices, excerpts from each learner's transcribed interview are systematised according to objectives/aspects, in order to characterise/analyse a "collective" ex-EP student, with an opinion and experience in relation to foreign languages, learning processes and different teaching strategies (a./d. parts of appendix G). This information complemented that gathered from teachers and current students.

The processes of answer coding and categorisation relied on the "always better trained" human "instrument of analysis" over time (Merriam, 1998). The inevitably incomplete understanding of the context was compensated through prolonged engagement, triangulation, among others in order to enhance credibility (cf. Tab. 2). Although we were interested in different viewpoints and we undertook a process of "open coding" and with a posture of "all is data", by means of this approach to content analysis our goal was not generating a theory through a strong philosophical basis, as "grounded theory" method or phenomenology does, rather concept development or model building[24] (cf. Hsieh & Shannon, 2005; Cho & Lee, 2014).

[22] Opportunities for representing and communicating Science concepts and processes, through verbal, visual, mathematical, kinaesthetic, etc. languages (cf. Lemke, 2003).

[23] Websites such as https://lup.lub.lu.se/search/publication/721abe20-281c-458c-9825-ed37a3ee77bd or https://linguistics.stackexchange.com/questions/836/ were consulted.

[24] No "axial coding" was used or "conceptual density" reached, but "a nuanced understanding of the lived experience" might have been offered through, e.g., tINTER (9, 17), sINTER (5, 8) and sQUEST (6 and 14/15).

5.4.3 Data collection through questionnaire (sQUEST)

This instrument (sQUEST; for questions and objectives, see appendix D) was developed for understanding the current students': (i) school profile; (ii) language repertoire; (iii) experience with "Science + English" out of school; (iv) relationship with (the learning of) English and languages (v) as well as with Science; (vi) difficulties encountered in Science classes; (vii) suggestions for Science and English teachers to improve the learning; (viii) opinion about the project, its advantages and obstacles. In appendix D, objectives per group of items and an overview of question typology are shown: 11 open-ended (2 entailing a short answer such as one word or single words; 9 requiring a generally longer text answer), 8 closed-ended (1 dichotomous, 3 multiple choice and 4 scale options of answers, of which 13. was an eleven-lined likert-type matrix and 5. looked like a matrix but easy to fill in), 2 mixed (short open answer for the last 2 contingency sub-items in 8.; 1 likert-type sub-item plus 1 long open answer) questions and a "free space" for contributions.

5.4.3.1 Structure and items of the questionnaire

Questionnaire[25] was written in Portuguese for students to feel comfortable in understanding questions and expressing themselves fully (E. W. K. Tsang, 1998). In order to orientate them, the form was divided into a general part followed by "*TU e as Línguas*", "*TU e as Ciências*", "*TU e a Avaliação*" e "*TU e o Projeto*". A short text was used to introduce the purpose of this data collection procedure and the learner's fundamental role in it. Considering the importance of creating a positive connection between the participant and the questionnaire and of making her/him feel at ease in responding since the beginning, we used the "friendly" you-derived forms in the sections mentioned above and in all questions, we asked the nickname that each student chose within the "English Plus" project (question n. 1) as well as the favourite school subject(s) (n. 5, with the exact denomination but in a random order, not to influence their choice), we opted for questions (such as n. 3 and 4) easy to answer at the beginning even though their content was not a point of interest for this inquiry.

Questions such as n. 6, 7 and 8 were aimed at achieving already more specific information (Science+English contexts and the student language profile) but they likely allowed for the informant to feel the value of her/his experience. We placed questions requiring a more complex thinking process or just more concentration (the open-ended n. 9, 10, 11 and 12 on English and Science learning or the matrix in n. 13 focused on difficulties) in the middle part, leaving other

[25] This data collection method was developed also through recommendations provided in http://www.fao.org/3/w3241e/w3241e05.htm#chapter%204:%20questionnaire%20design, in terms of, for example, opening and closing questions, question flow and variety.

open questions yet more direct or simple for the very end. It is worth saying that the range of marks in questions n. 16 and 17 is the same as the one used at these students' school.

Contexts of contact with languages in sub-items of 8. were adapted from those in the instrument used in previous studies (Simões et al., 2013), whereas the list of 9 languages (Portuguese being the first one) to select from and add to was based on the general linguistic exposure of Portuguese population (Simões & Araújo e Sá, 2013). Also the "*TU e o Projeto*" part was readapted from this last source and rephrased to be able to get informed about both the experience (more for 8th graders) and expectations (more for 7th ones) with the EP project. Question n. 7 (languages learnt at school) was intentionally designed to be open-ended, to let students make up their own list, which could also include their mother tongue (Portuguese).

Sub-items in question n. 13 are aspects (strategies, activities, resources, etc.) through which Science is taught, learnt and organised (Tenreiro Vieira & Vieira, 2014) and implying the use, thereby development, of language competences (i.e., for the understanding of lexicon, construction of maps or participating in debates). We asked students to "weight" difficulties they could have with them (using a scale of 5 points in ascending order of difficulty + N/A, not applicable), meaning to extrapolate the languages embedded in and possible obstacles to the learning of Science, which could be beneficial for scientific literacy.

5.4.3.2 Towards the final version of the questionnaire

Two independent experts (one in the field of FL education and European linguistic policies, one of Science education and sustainable development) reviewed (unclear, complex, ineffective) items. Revisions also resulted from a pilot we run in another school of the District of Aveiro in which students were attending, in 2015-2016, a project with the same name and a similar setting, and in the same school with another EP class but not involved in our study. Teachers also collaborated with relevant suggestions. Main changes were made, indicating by whom they were suggested, as follows:

a) text in the introduction making clear that the questionnaire purpose was not an assessment (experts) and using a more direct language with students (teachers);
b) question about favourite disciplines structured to allow for understanding also the order of preference and for an easier data collection (before piloting, students had to indistinctively identify their favourite subjects, sometimes selecting more than the recommended three);
c) moved the question aimed at knowing Science-with-English contexts daily experienced by students (n. 6) from the end to the first part of the questionnaire as a "natural" continuation

of the learner's profile (experts) and rephrased so that the mention to the school EP project (observed during piloting) would be minimised;

d) added an easy-to-tick list of languages for each of the contexts in n. 8 (experts); removed the * (being compulsory) from 8. b), not all students attending private language schools (teachers);

e) the original version envisaged a specific sequence from the question asking for (dis)agreeing about the importance of FL learning to the ones on aspects they liked to learn of Science, (language) difficulties in the learning of Science and suggestions for the Science teacher to improve the learning; an extended sequence was redesigned: importance of FL learning, aspects they liked about English (suggested by the language teacher) besides those about Science (the addition of "in their daily lives" was advocated by experts to avoid some overlapping with the question on importance of learning), importance of Science learning (expert: information also fundamental for the scientific literacy declared in the questionnaire objectives), suggestions for both the Science teacher and the English one. "*Acho importante …*" was postponed to "*Não acho importante…*" (expert: this was to minimise the tendency in preferring the "good" positive-formed sentence to the "bad" negative-formed one, somewhat expressed by Kamoen et al. (2013) in "respondents express their opinions more positively when the question is worded negatively", p. 181);

f) discussed with the experts about the matrix in n. 13, and opted for a 5-pointed (odd scale, ascending order of difficulty asked through from "*quase nunca*" to "*quase sempre*") Likert-type scale, the inclusion of a midpoint "not necessarily [being] harmful to the measurement reliability and validity [and not] forcing respondents to choose a direction" (K. K. Tsang, 2012, p. 127); their possible misinterpretation of and inclination for the midpoint was minimised, as these authors related, through describing options of all points as clear as possible (also resorting to numerical values when appropriate) and adding a N/A option (+1, "*não percebo*", to which "undecided" or "don't know" responses could converge). Experts also suggested a clearer rewording of aspects/lines connected with Science education ("*palavras científicas*" as "*compreensão de termos científicos*"; "*… debates sobre questões sociocientíficas*" as "*… debates sobre alterações climáticas, saúde, etc.*"; "*manipulação de materiais*" as "*possibilidade de manusear os materiais*"; etc.);

g) since students could use multiple choice of n. 19.1 to answer to question n. 20, learners were asked to relate advantages (n. 20) and disadvantages (n. 21) rather than just one advantage and one disadvantage (experts).

5.4.4 Questionnaire data treatment

Descriptive statistical analysis was performed on closed-ended answers (n. 2, 3, 4, 5, 8, 13, 16, 17, 18 and 19). Content of the rest of (open-ended) answers was qualitatively analysed.

5.4.4.1 Descriptive statistical analysis

Data were treated with the Excel and SPSS 21 software, through descriptive statistical analysis. We created additional variables to support answer description. For example, in order to analyse the ranking of (top three) favourite subjects emerging from question n. 5 or sub-items of question n. 8 (languages with which students have contact in defined contexts of their lives, cf. Piacentini & Simões, 2020), the variables "discipline identified as one of the three favourite ones" and "number of contexts related by students for each language" were created, respectively. Using the software statistical tools, we obtained frequency tables and measures of central tendency and construct graphs in order to describe and summarise distributions of students' answers. In the case of the open-ended questions n. 14 and 15, answers were first codified then quantified (cf. Piacentini et al., 2016). Furthermore, we calculated the number of occurrences for all coded answers to the questionnaire (Appendix H).

5.4.4.2 Qualitative content analysis

Analysis was carried out by means of the Atlas.Ti 6 software, at least in the first stages. Categorisation and its coding was peer-examined by experts in FL, Science education as well as of educational research in general but also through encounters with other PhD students and result dissemination. Moreover, the researcher herself "coded and recoded", thus refining the categorisation occurred in different moments of an extended period, as noted by Merriam (1998). Students' answers to open-ended questions were split in sub-answers (answers to n. 9 and 10 were rather eloquent in arguing about foreign languages; those to n. 14 and 15 provided more than one suggestion to the teacher) or entirely considered as a unit (n. 6, 11, 12 and 21 had more straightforward answers; the whole answer to n. 19 and 21 was seen if mentioning both Science and English, only English, other issues, etc.) for the qualitative content analysis.

Following procedures of inductive category formation as described by Mayring (2014, p. 106), we coded answers and identified fields from the learners' point of view: "Science together with English" experienced contexts; importance of the learning of foreign languages and Science; positive aspects of English and Science; suggestions for the Science and English teachers to improve learning; importance, advantages and difficulties of the Science+English EP project. In appendix H, category scheme and definition, examples of coded quotes and code frequencies are shown. The total almost never equaled 96 (44 7^{th} graders + 52 8^{th} graders), either because answers were split, as said before, or because some were excluded for being unclear or

idiosyncratic. Most of the times within results (see section 8), quotes of 7th and 8th graders were summed up to simplify the coding. Answers were not corrected when presenting grammatical or typographic mistakes.

Existing theoretical schemes were also applied (cf. b. and c. of the appendix H), with the aim of interpreting the inductive categorization. As for the FL learning (n. 9), coded answers were organised through the dimensions of Gardner's construct of motivation to second/foreign language learning (1993), and articulated with other components collected and highlighted by Dörnyei (1998). Answers to the other question (n. 10), actually, tended to present reasons for appreciating English, which could be also described as examples of an additional dimension of motivation constructs[26]. In the case of the coding for questions n. 11 and 12, on the other hand, organisation was based on groups of items[27] in the questionnaire developed by the ROSE (Relevance Of Science Education) international comparative research project "meant to shed light on factors of importance to the learning of science and technology (S&T) – as perceived by the learners" (Schreiner & Sjøberg, 2004). We then clustered these groups and resorted to concepts (the learning value or the sense of appraisal) used in another study on students' motivation factors towards Science learning (Tuan, Chin, & Shieh, 2005). In relation to the importance and advantages of learning through EP (n. 18.1 and 20), the categories "Composite learning", "English sphere", "Lifelong learning" and "Professional or academic future" – two of which are letters of the CLIL acronym – emerged from students' answers (cf. e., appendix H).

5.4.5 Secondary methods of data collection

Researcher's observation logbook (OBSV) was reviewed to confirm/disconfirm evidence from primary data sources, contributing to characterising the Science EP context and processes within the section of results (8). Selected documents (DOCS) were also used.

5.4.5.1 Observation of practices (OBSV)

Since the middle of October 2015, classroom observation was performed on the two 7th grade and one 8th grade EP classes. Preliminary classes were observed by both the PhD student and one of her supervisors, avoiding verbal intervention. Researcher wrote field notes right after observing classes, when possible, in a logbook that shifted from a more narrative to a more objective form, in so far as the researcher shifted from participant to observant (as already illustrated); a diversity

[26] Dimensions underlying 13 constructs of motivation to L2 learning (cf. Dörnyei, 1998, p. 128): (1) Affective/integrative; (2) Instrumental/pragmatic; (3) Macro-context-related; (4) Self-concept-related; (5); Goal-related (6); Educational context-related; (7) Significant others-related.

[27] What I want to learn about; My future job; Me and the environmental challenges; My science classes; My opinions about science and technology; My out-of-school experiences; Myself as a scientist (cf. index in the report of the ROSE project).

of examples are present within the appendix I. Observation was carried out roughly once per week during five full months' time. Besides the EP Science co-taught classes and PT English classes on Science topics (section 6.2) for current students, we also observed: practical lessons of Natural Sciences with half of their class at the lab, sessions in the classroom through a debate in English, one session in the classroom of working in groups, one session in the classroom of test correction in Portuguese, lesson planning and test design (both face and through email exchange) between Eng-old and Sci-new, and other moments such as non-official meetings (chats on the project and its implications, out of the conventional school spaces or through phone calls, etc.), theatre rehearsals at the end of the school year, student (research) questionnaire answering and (school) project assessment. Researcher diversified contexts observed in order to understand the phenomenon (school organisation and educational practices) from a diversity of angles and until information started repeating and matching from different sources (saturation point). Only at the end of the second term teachers allowed also for the lesson (video) recording, but files were not usable. In the last two weeks of school the researcher was able to "pilot" the tool for observing the "Language use in/and Science learning in interaction" (cf. Piacentini et al., 2017) – constructed under the external supervision of Natalia Evnitskaya, Ana Llinares and Rachel Whittaker within a consultation on CLIL in Madrid in May 2016 – filling in it along with an audio-recorder functioning. After the 2015-2016 school year, a systematic use of such instrument was not possible (students often involved in other activities; researcher's family leaves; teachers' private issues).

5.4.5.2 Collection of documents (DOCS)

Documents have been gathered (spontaneously or on request) from teachers or downloaded from the school website, throughout the research process. Here, the selection of them:

- *Projeto Educativo* 2014-2017 (including the year of our study), that is, the educational project of the whole school;
- *Programa da disciplina de oferta de escola (projeto English Plus)* 2015-2016, that is, the EP programme;
- *Relatório de Atividades* of the "English Plus" project, that is, report on the (Science) EP activities in 2015-2016 (the year of our study).

5.5 Ethical Considerations

At the end of the school year before our empirical study (July 2, 2015), an introductory meeting between two of the future EP teachers, their principal, the PhD student and her main supervisor (Ana Raquel Simões) occurred, enabling a first face contact and the agreement between the school under investigation and the UA-CIDTFF centre to be made official. "Collaboration Protocol"

consisted of: interests and duties of university in terms of collaboration with the community, including a school where a CLIL project had been implemented; research-mediated *acompanhamento* of such project as the protocol object (motivated by different learning objectives and supporting the present study); points (duration, confidentiality, intellectual property, etc.) agreed by the signing parts; statements on the need for regular meetings between the parts as well as class observation and other activities; section on possible conflicts and their resolution, and the parts' signatures.

It is worth reminding that a similar "umbrella" protocol had been signed also within the first collaboration between the school providing the "English Plus" project in 2010-2013 and UA-CIDTFF researchers expert in language education. Since the teacher interview and preliminary observation, an environment of trust and reciprocity was created between the researcher and teachers, as evident in the description of instruments (section 5.4) and validity (section 5.6). Namely, participant teachers were involved in different contexts and moments of our study. Needless to say, although English was the language of project classes and subjects were proficient in English, the researcher related to teachers (planning or evaluating activities, taking decisions, etc.) and students (helping them when they had doubts, sharing with them during breaks, etc.) speaking Portuguese.

Teacher interview was audio-recorded with the interviewee's oral consent (September 16, 2015). The English teacher of the ex-EP students – the same they had had in 2010-2013 within the project of integration – was crucial for their interview, even in having suggested the idea of interviewing former learners: she involved them again as EP "experts", by asking them for giving their point of view about the project to the researcher, and also informed their parents in relation to this "updated engagement". Before the start of the actual interview (May 17-24-31, 2016), the researcher introduced herself, her personal and professional background and her investigation briefly to each student to establish rapport; students orally assented to be audio-recorded. With regards to the current student (online administered) questionnaire, observation (audio/video-recorded or not) of some of their classes with the EP teachers as well as other activities implying the presence of an external member, since the middle of October 2015 the spokesperson teacher delivered a form for families authorising their daughters and sons to participate in the inquiry, with its data collection techniques and guarantee for informants.

All records are safely stored. The deidentification done on written information (transcribed interviews, typed open answers and related publications) can not ensure for absolute anonymity, since whoever is acquainted with the "English Plus" project could associate the report to people.

Personal information, and information not adequate or relevant for the context, is kept confidential. Data will be made available in official databases (i.e., CERN's open-access Zenodo repository) after the participants' "process consent". Issues brought here were discussed with Martin Tolich, ethics advisor, almost at the end of the PhD path (September 27, 2019).

5.6 Trustworthiness of our Research

As disclosed at the end of section 5.2, "rigor is needed in all kinds of research to insure that findings are to be trusted and believed. In applied fields like education […] the question of the trustworthiness of research findings looms large; after all, much research is designed to understand and improve practice" (Merriam, 1995, p. 51). Through the following organisation we expounded/summarised criteria of our qualitative case study (Tab. 2). We were as more detailed and transparent as possible, aligning with Lopes, Pedrosa-de-Jesus and Watts in that "the purpose of validation […] is not to provide a single answer [but] resilient attempts to *minimize invalidity* […] the more comprehensive the approach to validation, the less *invalidity* can be aimed at discrediting the overall task" (2016, pp. 4–10). According to most authors, internal validity is a "strength" of qualitative research, whereas reliability as replication cannot be a criterion for it, since "studying people and human behaviour is not the same as studying inanimate matter. Human behaviour is never static. Classroom interaction is not the same, day after day, […] nor are people's understanding of the world around them" (Merriam, 1995, p. 55). Instead, we should assume the Guba and Lincoln's notion of "dependability" and how we managed to enhance it. On a different level, Merriam affirms that "the question of external validity or generalizability seems to haunt qualitative research more than any other, probably because most people think […] in the statistical sense of extrapolating from a sample to a population" (1995, p. 57). Nevertheless, qualitative studies aim, mostly, at understanding the particular in depth (Merriam, 1995) and envisage more possibilities than the statistical (empirical) generalisation (E. W. K. Tsang, 2014). We are actually supposed to view "external validity from the perspective of the assumptions underlying qualitative research" (Merriam, 1995, p. 59) and consider it in terms of working hypotheses, concrete universals, or reader/user generalisability[28] but also as usefulness for stakeholders, as expressed below.

[28] Other reformulations of generalisability (cf. Merriam, 1995): "working hypotheses" reflect situation-specific conditions of a particular context and precede generalisation, they are meaningful within the local settings; "concrete universals" are grounded in that particular situations convey insights transcending the circumstances from which they emerge, hence they can be applied to similar situations; "reader or user generalisability" means that it is the consumer of research, rather than the researcher, who reads the report of an inquiry and decides to speculate how findings are transferable to other settings.

Table 2: quality criteria of our qualitative case study; adapted from Zohrabi (2013, pp. 258–259), integrated with Guba and Lincoln's denominations (1994) and expanded by Merriam's strategies to discuss intellectual rigour, professional integrity and methodological competences as qualitative researchers.

VALIDITY – instruments and data should be valid to make our research credible *There are 'fewer' layers between the researcher and the phenomenon under investigation. The strategies […] can help ensure that the interpretation of 'reality' being presented is as 'true' to the phenomenon as possible.*	
CONTENT (instrument construction)	tINTER – competences displayed in the guide broadly based on the CLIL Teacher's competences Grid; question clearness and effectiveness tested through interviewing first young researchers with teaching experience sQUEST – sections on aspects typical of Science education, on FL and language profile as well as the "English Plus" project adapted from existing literature; two independent experts reviewing (unclear, complex, ineffective) items; pilot through comparable students and consequent revisions
INTERNAL (congruence of findings with the reality)	**1. triangulation** Data were collected from a diversity of sources (teachers, younger and older students; different times and places) and through multiple techniques (interview, questionnaire, observation and document collection), corroborating the findings obtained in different manners. Multiple investigators observed only specific episodes (first meeting, preliminary observation of project classes, seminar at school), enabling "cross-checked" impressions. **2. member checks** Transcripts were shared with the teachers previously interviewed (tINTER), for them to recognise whether information was true or not, but no explicit feedback was ever provided. The online version of the current student questionnaire (sQUEST) guaranteed that respondents could check their answers while typing as well as avoided that the researcher had to interpret their handwriting. The instrument developed for observing and orientating CLIL Science classes (OBSV) was also shared with teachers as well as preliminary results achieved through the questionnaire, an infographic on the context characterisation and the press release with relevant findings, to try to verify that data interpretations "back to the people from whom they were derived" sounded plausible. **3. long-term data collection** Data were collected over an extended period of time for an in-depth phenomenon understanding, till achieving the "saturation point". For instance, observation changed from *covert*-generalised to *overt*-focused in

INTERNAL (congruence of findings with the reality)	the process of obtaining answers to research question; moreover, data collection ended when same information derived from different sources or methods. **4. peer examination** Both the research design and observation instrument were discussed within consultations in centres abroad (Vilnius, Barcelona and Madrid). Data analysis and interpretation were reviewed and commented on by colleagues who were not participants in the field but familiar with the subject, boosting the credibility: sQUEST (open-ended answers) – coding (relative to the contexts of Science-with-English out of school, Science and FL learning and teaching, (dis)advantages of learning within EP) examined by experts and through events; sINTER – coding/themes (the student's linguistic and cultural profile and the EP learning experience through communicating), reviewing and publishing; tINTER – themes of "Science languages" in conventional and project classes through paper submissions and one colleague's support and of EP teachers' cultural perspectives through the writing and publishing process of a chapter. **5. participatory or collaborative research modes** Mainly the EP teachers were involved in different stages of the inquiry: the researcher invited Eng-old to ask current students for choosing a nickname within EP (useful for the project itself and to motivate the questionnaire answering); Eng-old and Sci-new proposed a rewording that could better work with students (sQUEST); Power Points of CLIL Science classes were shared with Sci-new and Sci-old, before and after implementation; teachers delivered materials and documents (DOCS); Eng-old motivated the interview and selection of the former EP students and suggested how to rephrase some questions (sINTER); the investigator's viewpoint (on the 2015-2016 EP programme at school) was written in the report for the school; a workshop on CLIL at the local school was organised together with Sci-new and Eng-old; resources (frameworks, websites, leaflets, etc.) and information (events, courses, articles, etc.) were shared; further school documents (DOCS) were requested or doubts on school and class organisation solved through email exchange with Sci-new after the face study year. **6. statement and minimisation of researcher's bias** Presenting our experiences, beliefs and views – as through the biographical introduction, the section on knowledge, design and instruments, and the below context characterisation – allows for a better understanding of how "the data might have been interpreted in the

	manner in which they were", as well as the transparency and accuracy attempted throughout the research process and writing. Furthermore, the inquirer's biases might have been "diluted" over time (four year span) through internal and external supervision.
EXTERNAL (possibility of generalisation)	Transferability of the design/results of the present research on Science education articulated and potentiated with the presence of English could be feasible for other subjects (see previous studies on the "English Plus" project of History and teachers of other areas involved between 2010 and 2017) and other contexts, as long as the school level is the same (lower secondary grades, in which students are reasonably skilled at English and the teaching of specific subjects like Science is somewhat specialised) and the school organisation allows for co-teaching, co-planning or at least the "integrated learning" and its observation. Actually, during the year of the empirical study, the EP Science project started in another school of the District of Aveiro. Our provision of a "thick description" (of the phenomenon under study) and "modal comparison" (between the programme or participants and non-project classes and settings) is likely to enable the reader/user to determine whether findings can be transferred to their situations, and also to grasp what works in the local context and what applies universally. Human processes, obviously, have to be taken with a different regard.
UTILITY (usefulness for stakeholders)	Articles have been read and recommended in sites where the researcher has signed up (specifically, in Research Gate), even though the only trackable citations are related to one study on Science learning and the use of feedback by a primary teacher in a bilingual Bruneian school (Roslan, Panjang, Yusof, & Shahrill, 2018) and to one overviewing CLIL projects in the Portuguese context in the last decade (Ellison, 2018). Besides academic publications, research findings have been "opened" through other accessible formats: the core was communicated, in 2018, at the Fame Lab and Research Summit in Aveiro, but also published as *H(À) Educação* at the end of 2019; the infographic on context characterisation and relevant results presented in different events (SciComPT '19, III ENJIE in 2019, 2018 CLIL colloquium and training, SCoRE|17), during which some teachers and also researchers asked for details of the inquiry, were interested in keeping more information through a leaflet with the infographic and a list of resources and references (prepared by the PhD student) and discussed about similar experiences. More and more schools in Portugal have actually showed interest in the CLIL approach and some pursued consultation of our research expertise; to same extent, they can depend upon depictions and information of our study.

(int) REALIBILITY – based on data collec. proced., results are dependable and consistent
[…] replication of a qualitative investigation will not yield the same results […] both sets of results stands as two interpretations of the phenomenon […] the findings of an investigation reflect, to the best of the researcher's ability, the data collected.

1. triangulation
The fact that aspects/results were achieved analysing and interpreting the information gathered from different sources and through multiple techniques (cf. 1. In the previous part), in particular, increased the trustworthiness.

2. peer examination
Supervisors verified that the emerging results showed consistence with the data collected, throughout the research process and, again, other independent researchers checked this criterion. Also, the PhD student worked on theme formation of same information in different times, "becoming a more reliable human instrument", and audio-recorded data could be, in principle, reanalysed.

3. audit trial
The methodological section reported on instruments and procedures in detail, describing "how data were collected, how categories were derived, and how decisions were made throughout the inquiry", as well as the status of the researcher, the choice of informants and social situation of the school were made clear. In sum, the report could be used as a "dependable manual to repeat the study".

6. Context Characterisation

The FL situation of the educational system in Portugal is presented (section 6.1), first, and followed by a description of the school project under study (section 6.2).

6.1 English in the Portuguese school system and CLIL programmes – bilingual schools

In Portuguese compulsory education, the teaching and learning of foreign languages, since 2012, has been offered in the 2nd cycle of primary education (from the 5th to the 6th grades, ages 10-11) with the English language, and only in the following cycle (that is, starting at age 12) with French, German and Spanish. It was in the 2015-2016 school year that English was introduced as a compulsory subject from the 3rd grade, implying changes in the curriculum and syllabus development as well as a clearer teacher education background (Lourenço & Mourão, 2017). In the 2nd and 3rd cycles, the average time of English classes per week is 90-120 minutes and its education may continue until the 11th grade at secondary school, regardless of the field of studies. Nowadays, students learn a second FL (French or Spanish) only from the 7th grade onwards. The importance attributed to English is also evident within a diversity of Portuguese CLIL initiatives,

both institutionalised and grassroots, at compulsory school levels (Ellison, 2018; European Commission, 2017), where English is the foreign language most frequently selected.

The *Programa Escolas Bilingues em Inglês* (PEBI)[29], organised by the Ministry of Education and the British Council in Portugal, is a top-down programme piloted from 2011 to 2015. Every year state primary schools can apply to the *Direção-Geral da Educação* for "becoming bilingual", the goal being the coverage of 5% of the Portuguese state primary schools by 2020, as one can read in the official website. PEBI currently involves 23 state school clusters and integrates English in the daily activities of pre-primary school levels and English with different specific subjects of primary school up to the 9th grade (Social Studies or Expressions in the 1st cycle and also Science and Mathematics in 2nd and 3rd cycles). From an external perspective (an Italian person and teacher), it is worth relating that Portuguese people appear to have a higher fluency in English, if compared to other countries speaking a romance language such as Spain or Italy[30] (where movies are dubbed), a fact that is also reflected in their self-perception, as exemplified by one subject teacher (Sci-new) during her interview: *os Portugueses, como não têm a televisão traduzida […] vão apanhando pelo menos o sotaque e algumas expressões idiomáticas […] eu acho que facilita […] eu ouço falar [que] os Portugueses vão se safando nas línguas*.

6.2 The CLIL-type "English Plus" project in the school under study

Driven by our research questions aimed at investigating possible connections between CLIL teacher practices and the attention given to Language(s) of Science education, we were interested in bottom-up initiatives of compulsory instruction where teachers design their own CLIL contributions (timetable, strategies, material) through the curriculum, such as in the "STEPS - UP", "Benchmarking CLIL", "GoCLIL", or "English Plus" (EP) projects (Ellison, 2018). As already delineated in the 5.2 and 5.3 methodological sections, the EP project had certain features that made it a "convenient choice" to be the empirical object of our inquiry: (i) possibility/facilitation of/in continuing a collaboration that teachers themselves had sought a few years before; (ii) the educational integration involving the Science subject in the year of our study; (iii) the programme being provided in the 3rd cycle of the Portuguese primary education[31;] (iv) teachers' educational

[29] For further information, https://www.dge.mec.pt/programa-escolas-bilinguesbilingual-schools-programme.

[30] See also data in https://languageknowledge.eu/languages/english, based on the 2012 Eurobarometer survey on Europeans and their languages.

[31] The 3rd CEB (7th, 8th and 9th grades) was chosen as the target school level because students' skills in terms of foreign language are expected to be more advanced than in previous cycles and it presents an established separation of curricular areas started in the 2nd CEB, which justifies a programme of articulation including another language (so the cross-curricular STEAM approach was not opportune to our research).

initiatives and availability for an exchange with researchers; and (v) the relative proximity of the school to the university.

Infographic of Fig. 3 allows for a visual understanding of the school context and project provision. Context characterisation was possible through the reading of scientific publications and school documents, researcher's observation, teachers' and students' interviews as well as further contact with EP teachers also after the study was "completed".

Its first edition was undertaken between 2010 and 2013 by teachers with students of one class in one state-run school in North Portugal[32], and monitored by researchers from our group, LALE-CIDTFF, with regard to stakeholders'[33] perceptions (Simões et al., 2013). It was one English teacher (Eng-old) who introduced and developed this educational integration as a strategy of language promotion within specific subject classes – other than the top-down bilingual French class (*sessão europeia*), previously provided by the school – collaborating with one History teacher first and other motivated teachers later on. Eng-old reactivated the project in 2014-2015 for Natural Sciences (NS) in the same institution, involving one Science teacher, supported EP starting in another school of the same district (in 2015-2016, also in NS)[34], and coordinated a further collaboration with the same research group since 2015-2016, the year of our study in loco (Piacentini & Simões, 2020; Piacentini et al., 2016, 2017, 2018, 2019).

[32] In terms of socio-economic indicators, the school cluster belongs to an area of around 160 km^2 where approximately 69,000 inhabitants live; the 2011 Census revealed a population decrease of about 2000 inhabitants and a 2,8% reduction in birth rate. The primary economic activities are transformative industry, commerce and services. The business sector is dominated by micro-business. Employment is provided largely by the secondary (56%) and tertiary (43%) sectors. Unemployment has risen, following the national trend, and in 2011 was 8,85%. As for the socio-educational landscape, according to the same Census, the level of illiteracy was 4,07%. Among 25-29 year olds, the predominant school levels attained are the third cycle of primary school, secondary school or, significantly less compared with the other levels, higher education. Among 10-15 year olds, 0.99% leave school without finishing the 9^{th} grade. Among 18-24 year olds, the percentage who do not complete secondary school is 24,49%. In 2013-2014, the majority of student's mothers' (2415 registrations on the MISI platform) level of education is primary school (54%), among which 14,2% completed the first, 24,7% the second and 15,1% the third cycles. Another 14% have secondary school qualifications and slightly higher levels of higher education, 15,2%. The remaining 16,7% had no known qualifications. Among fathers (2614 registrations), the distribution is similar, with 53,2% having primary school (13% first, 24,4% second and 15,8% third cycles), 17,8% secondary school, while only 10,6% some form of higher education qualification. The remaining 18,3% had no known qualifications (School *Projeto Educativo* 2014-2017, available on https://w4.soaresbasto.pt/projeto-educativo/).

[33] Stakeholders were students, their parents or corresponding roles, teachers and school managers.

[34] The EP class of this school actually twinned with one EP class belonging to the school under study in 2015-2016, through email exchange and school trips where students used the nicknames chosen within the "English Plus" project of Science.

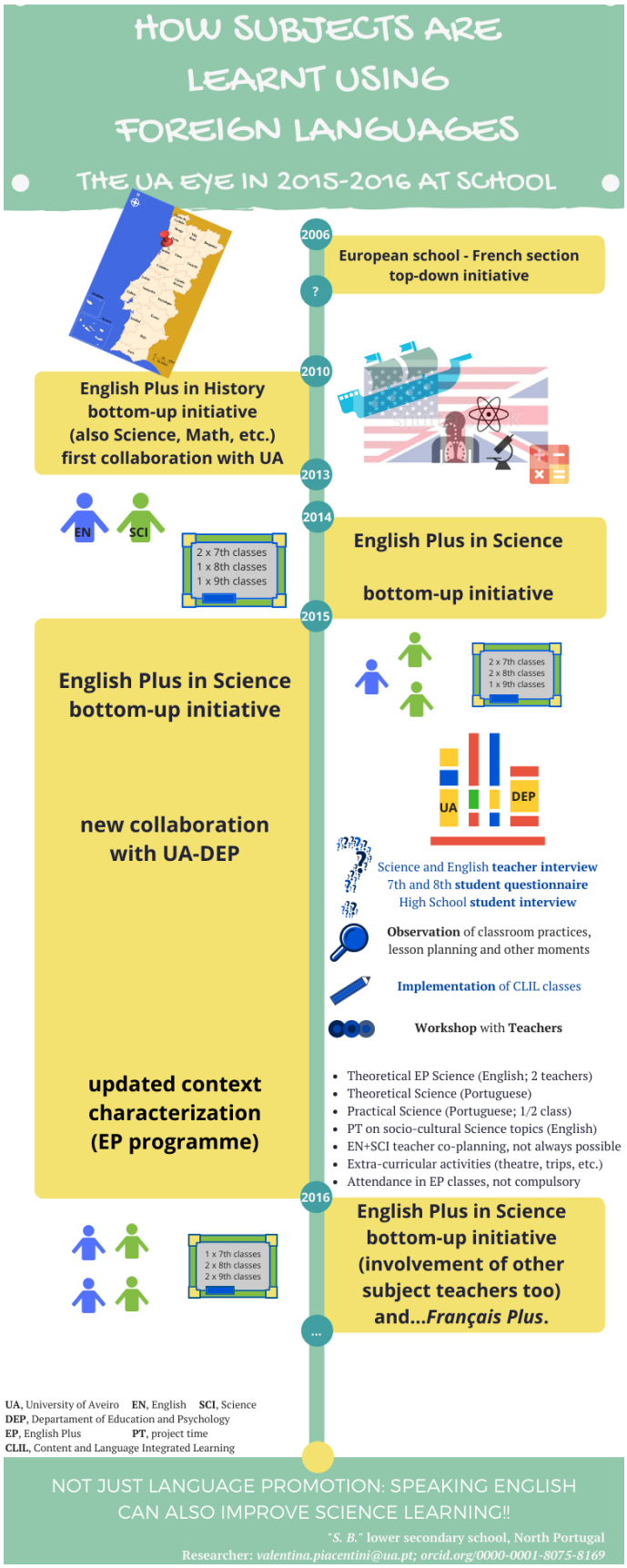


Figure 3: infographic on the EP context adapted from that developed within the SCoRE|17 doctoral school (customised from the Canva ghraphic design website).

During this year, out of 20 classes in the school, two at 7th grade, two at 8th and one at 9th were involved with two Science (Sci-new and Sci-old) and two English (Eng-new and Eng-old) teachers in the EP project (Sci-new with 7th graders, Sci-old with 8th and 9th; Eng-old with the five EP groups; Eng-new assisting Eng-old for some hours). In 2016-2017, 2017-2018 and 2018-2019 total number of EP classes remained the same, even though with a different distribution in terms of grades. Students' attendance of the "English Plus" programme was voluntary, being based on learners' or parents' decision, but also on a selection process on merit (marks in the English subject from previous years) if demand was too high; in the last two years, all requests have been accepted. No continuation of the project approach was envisaged for them at high school.

The EP week setting was:

- 45 minutes of theoretical NS with English (EP classes, co-teaching: both subject and language teachers are present in Science classes and using English),
- 45 minutes of the same Science subject held mainly in Portuguese (non-EP classes, single-teaching: classes are given by the non-language teacher alone, who could opt for Portuguese but also English, as emerged in both teacher and student interviews, sometimes deploying project-like strategies) and
- 45 of *hora de projeto* – project time (PT classes: a space where the English teacher encourages socio-scientific discussion using English, as observed during the study).

Within the first edition, this hour was devoted to citizenship or sex education using English and to task- or project-based learning (short theatre plays, study visit preparation, etc.) having a connection with History; over time, it turned into content-based language instruction (features and contexts of English were explored through topics of Physics-Chemistry, Mathematics and Natural Sciences; cf. Dale & Tanner, 2012)[35]. As read in the "English Plus" *Programa* and *Relatório*, the project (better said, PT time) was considered as the school "complementary offer". Given this specific organisation – PT classes alongside the co-teaching practice (besides teamwork planning and evaluation), which has been detected only in Catalan contexts (i.e., Escobar Urmeneta, 2013; Valdés-Sánchez & Espinet, 2020) to overcome possible obstacles with the foreign language and representing a learning process for teachers – we refer to EP as a CLIL-type provision.

[35] The following excerpt from Sci-old is significant to understand this evolution: *a professora [de Inglês] abordou-me e pediu-me para […] experimentar ir lá dar um qualquer coisa em Inglês de Ciências […] jamais me passou pela cabeça […] mas disse ok […] vou dar uma coisa sobre os dinossauros porque é um assunto que é interessante e eles vão aprender vocabulário […] comecei então a ir à Educação para a Cidadania [hora de projeto] dela […] estava livre [para] todas as semanas dar 45 minutos [por outro lado] tinha as minhas aulas [já] em Português e dava aquilo [Educação Sexual em Inglês, depois da primeira experiência]. Extra*.

Practical NS classes, which occurred in the laboratory and with half the class at a time (45 minutes each group, while the other worked with the Physics-Chemistry teacher), were not included in this school-led programme. Also, the rest of the curriculum (classes of English, 90+45, and the second foreign language as well as the other disciplines) coincided with the standard student curriculum. Project students were usually "engaged" in extra-curricular activities, as observed during the empirical study and revealed by teacher and student interviews: school trips to (Science) educational institutions or English speaking countries, as well as their organisation (also involving parents); theatre performances (creative History/Science using English) and cinema sessions (with movies in English and related to Science topics); workshops with LALE to foster awareness for linguistic and cultural diversity; "open day", among others.

Teachers involved in this project had co-planning – subject and language teachers working together on EP and PT implementation and material construction/revision – available once a week in their timetables; if that was not possible, extra email exchange or short meetings among colleagues occurred, besides the normal working time, as observed several times. The Science teachers did not use to write a plan for EP Science classes, but they brought the necessary changes in the implementation, as they clarified themselves in emails to the researcher (Sci-new, *as planificações […] são iguais [às de CN]. A única diferença […] está na realização da aula*; Sci-old, *no 7º ano não segui a ordem da planificação para facilitar a aprendizagem em língua inglesa. Algumas atividades também foram diferentes devido ao projeto*). According to the content topic, they could choose suitable units to teach with the use of English, rather than covering the whole syllabus (in the middle of 2015-2016, actually, Sci-old declared that *tudo [o programa do 8º ano através do EP] não dá*).

EP teachers were not rewarded financially for the extra work entailed in the project (Eng-old, *as horas extra que se tem que estar na escola depois para envolver os pais, as atividades que se têm que fazer às 6 da tarde à sexta feira […] acaba por […] interferir um bocadinho com a vida pessoal*). At the end of 2015-2016, teachers reported the strong dedication required of Eng-old who had five EP classes, that is, five PT times with different students per week and five to co-teach and prepare. The year after, EP work was distributed and balanced through the actual Eng-new's inclusion. As a matter of fact, co-taught classes and PT times were not always viable for all groups, because of Eng-old's personal complications.

Teachers of other subject areas (Physics-Chemistry, Mathematics, etc.) also showed motivation for this CLIL-type approach, as reflected in the EP planning document (asking for language support from the English teacher) and implementation of occasional classes (though the English teacher

could not be present) for EP students, through a "concerted action" similar to that during the first EP edition and also extended to the other above-mentioned school in the same district, as read in the 2015-2016 EP report. Working as a teacher within the "English Plus" project was seen indeed as a worthy endeavor (*antes se estranha, logo se entranha*, the coordinator teacher, Eng-old, said). Probably, the reopening of a French *sessão europeia* in 2016-2017 was triggered by this commitment to languages and interdisciplinarity present at the school. The school interest in "being and doing" CLIL was also clear in the participation of project teachers in other educational opportunities with our research group, at the end of the empirical study, such as the co-organisation of a training course[36] on CLIL (November 9, 2016). During the school years after the investigation, the school project continued but collaboration with the university occurred sporadically and was mainly based on the inquirer's initiative through email contact, sharing findings and resources or alerting to events.

7. Conceptual Path[37]

Works published during Valentina's PhD and focused on this research are introduced here, weblink-embedded and followed by the roman number used in the present section and within results. Theoretical parts have been already drawn from these articles and organised holistically in the state of the art (section 3). In this context, we mean to direct the reader's attention to their specific empirical sections (each time indicated in brackets, by both the page numbers of the relative publication and the sequence number used in the following table). The order of presentation in the next paragraph is not chronological, instead, a conceptual route among them is described, so that one can globally grasp: the empirical context; the participants' profile, in relation to English, Science and the project; "Science languages" practiced by teachers and difficulties encountered by students; suggestions emerging from the learners' side and possible orientations for teaching.

> **IV** Piacentini, V., Simões, A. R., & Vieira, R. M. (2016). Abordagem holística no sistema educativo português para desenvolver a(s) Literacia(s) das Ciências integradas com o Inglês. *Indagatio Didactica, 8*(1), 1975-1992. http://revistas.ua.pt/index.php/ID/article/view/3981
>
> **I** Piacentini, V., Simões, A. R., & Vieira, R. M. (2017). The language focus of Science education integrated with English learning. *Enseñanza de Las Ciencias, Extra*(2017), 399–404. https://ddd.uab.cat/record/184622

[36] Short term (3h) training session certified by the Portuguese AVCOA (*Centro de Formação de Associação de Escolas*, Arouca- Vale de Cambra – Oliveira de Azeméis) education centre.

[37] When researcher "turned" towards the option of thesis by articles (art. 64, 1. of the UA regulations: "*modalidade alternative à tese*", *conjunto de trabalhos científicos já publicados* plus a diversity of *vertentes de atuação*), this part along with others before were "validated" by a few Education researchers.

III Piacentini, V., Simões, A. R., & Vieira, R. M. (2018). What students tell teachers about practices that integrate subjects with English in a lower secondary school in Portugal. *eTEALS, 9*(s1), 57-76. DOI: 10.2478/eteals-2018-0013

V Piacentini, V., Simões, A. R., & Vieira, R. M. (2019). Teachers' view of Language(s) in (CLIL) Science education: a case study in Portugal. *Problems of Education in the 21st Century, 77*(5), 636-649. DOI: 10.33225/pec/19.77.636

II Piacentini, V., & Simões, A. R. (2020). CLIL: a way to develop plurilingual and intercultural competences in schools? In F. Anastassiou & G. Andreou (Eds.), *English as a foreign language: Perspectives on teaching, multilingualism and interculturalism* (pp. 54-83). Cambridge: Cambridge Scholars Publishing.

A brief description of theoretical frameworks or referential concepts/contexts related to (Science) educational approaches that are aware of languages or directed to literacy (Science classroom discourse; Science genres; CLIL; non-native English Science learners; 5Es Science instruction model; etc.) is presented in work I, within the details of the "Language use in/and Science learning in interaction" tool (p. 401, n. 1). This instrument gathers the knowledge on this field of (research on) Science education and might support the development of Science teaching methodologies with a language focus, as already portrayed in the section of the state of the art. In work II, the local context of our empirical study – wherein a specific subject is taught and learnt with/in a foreign language within the language-aware CLIL approach – is described, in terms of (pp. 59-64, n. 2): the Portuguese school system and CLIL programmes; the "English Plus" (EP) project as one CLIL bottom-up teacher initiative, in History (2010-2013) and Science (since 2014 onwards); participants (students and teachers).

The students' perspective about the EP project is expressed in work III (the disciplines involved and the approach, according to former learners, pp. 63-64, n. 3) and work IV (its importance and disciplines benefitting, according to current ones, pp. 1981-1982, n. 4). The understanding of the (former and current) students' linguistic and cultural profile as well as current students' relationship with English and other languages are enabled by work II (pp. 64-72, n. 5 and 6). Furthermore, their learning attitudes towards the Science area, are identified, at a preliminary level, in work IV (pp. 1988-1989, n. 7). Work II gives a hint of the English teachers' ideas about cultural aspects that can be developed through English EP classes, and that could also enhance the vision of Science (pp. 73-74, n. 8).

Practices of Language(s) (verbal language in the mother tongue or English and other representation modalities: images, symbols, actions, etc.) of Science, in non-CLIL and CLIL settings, are characterised through the voice of participant teachers in work V (pp. 640-641, n. 9 and 10). Also in connection with "Science languages", work IV detects the difficulties learners perceive in

relation to aspects of Science (education) in which language(s) are “embedded”, such as specific lexicon, debates, concept maps (pp. 1982-1984, n. 11), as much as work III clarifies the importance, the advantages and constraints that they see in this CLIL Science project (pp. 66-69, n. 12). Classroom practices as observed by the researcher are used to complement these results, succinctly, in works V and IV (pp. 642-643 and p. 1989, respectively, n. 13 and 14). Suggestions for enhancing teaching strategies and the use of Language(s) in Science classes – both when the L1 is spoken (non-CLIL, conventional) and a L2 is integrated (CLIL, project) – emerge from younger students, so that their teachers can improve the Science (and English) learning (work IV, pp. 1984-1986, n. 15). In support of this, older students’ reflections on the single-teaching and co-teaching of Content classes are provided in work III (pp. 64-66, n. 16).

Moreover, our works reveal the everyday contexts through which learners “naturally” experience Science with English (work IV, pp. 1986-1987, n. 17) as well as those wherein they have contact with more than one language (work II, p. 66, n. 18), an information that can orientate the understanding and planning of school environments favourable for the Science-English integration. These two publications also briefly indicate the role of English in Science communication (p. 73 and p. 1990, respectively, n. 19 and 20), to take into consideration with care in working with students. Finally, the instrument of work I (pp. 400-402, n. 21) is a prospective and retrospective proposal to facilitate the observation of the role of Language(s) in Science education within classroom interaction of Science CLIL and non-CLIL contexts in further studies; and to allow teachers to become language-aware in the planning, implementation and assessment of Science classes. Teaching through CLIL represents, in fact, a learning process for teachers who could adopt the focus of language and improve their practices, irrespective to the language spoken in class (the idea of CMIL – Content and Mother tongue Integrated Learning – drawn in work V, p. 644, n. 22).

A synthesis of the five publications is displayed in Tab. 3, in terms of research objectives (as formulated within articles), data collection and analysis techniques, and relevant contributions to the whole PhD research. In the final chapter, results will be presented taking into account those already published through the corpus of Chapter 2, their necessary update and improvement as well as further findings that emerged from the continuation of the study and analysis.

Table 3: publications (in the same order as in the next chapter) and research objectives, data collection and analysis, and empirical contributions (sequence of numbers is relative to the text of the path).

Published works	Research objectives	Data collection and source	Data analysis	Empirical contributions
I The language focus of Science education integrated with English learning (2017)	To construct a context-derived instrument for investigating on and supervising teacher planning and classroom practices whereby cross-curricular integration between Science and English has been developed, through a content-based language instruction approach in one Portuguese school (the CLIL "English Plus" project of Science). No data were collected nor analysed.			**1.** references converging in the instrument **21.** instrument for observing and implementing (CLIL) Science classes
II CLIL: a way to develop plurilingual and intercultural competences in schools? (2020)	To understand the position of CLIL language teachers and CLIL students – who had more contact with English through the project – with respect to (the project language) EN and (experience with) other languages and cultures. To identify contexts and aspects of the learner experience that might foster more plurilingual and intercultural teaching practices through EN in language and project classes.	• questionnaire (current students) • interview (former students) • interview (teachers)	• descriptive statistical analysis on closed-ended answers to the questionnaire • inductive content analysis of open-ended (questionnaire) and transcribed (interview) answers	**2.** local context of the study **5.** student linguistic and cultural profile **6.** current students on English and other FLs **8.** teachers and cultural aspects of English and project classes **18.** current students' plurilingual contexts **20.** teachers and English's role to communicate Science
III What students tell teachers about practices that integrate subjects with English in a lower secondary school in Portugal (2018)	To characterise students' perspectives through exploring their relationship with the "integration project" and its approach, as well as benefits and difficulties they identify in learning a specific discipline with/in a FL.	• questionnaire (current students) • interview (former students)	• inductive content analysis of open-ended (questionnaire) and transcribed (interview) answers	**3.** former and current students on the project **12.** current students' benefits and difficulties with Science+English **16.** former students' reflections on project and standard classes

IV Abordagem holística no sistema educativo português para desenvolver a(s) Literacia(s) das Ciências integradas com o Inglês (2016)	To identify the learners' perceptions in relation to: the project articulating SCI education with the EN language (the "English Plus" project of Science); difficulties with SCI education and aspects connected with the use of language(s); suggestions for the SCI and EN teachers to improve learning of students; everyday experience with SCI+EN contexts; importance of the learning of SCI. To characterise the CLIL EP project of Science, at least at a preliminary level, to later on contribute to paths for the development of the scientific literacy.	• questionnaire (current students)	• descriptive statistical analysis on closed-ended answers • inductive content analysis of open-ended answers	**4.** students on the project **7.** students on Science learning **11.** students' difficulties with Science languages **14.** observed classroom practices (secondarily) **15.** students' suggestions for Science classes **17.** students' Science+English contexts **19.** teachers and English's role to communicate Science
V Teachers' view of Language(s) in (CLIL) Science education: A case study in Portugal (2019)	To understand, from teachers involved in the EP programme, the role of Language(s) in the teaching of Science [opportunities for representing and communicating (verbally, visually, mathematically, kinaesthetically, etc.) SCI concepts and processes], within "normal" and CLIL practice (where PT and EN are used, respectively).	• interview (teachers)	• inductive content analysis of transcribed answers	**9.** teacher spoken use of Science languages in non-CLIL classes **10.** teacher spoken use of Science languages in CLIL classes **13.** observed classroom practices (secondarily) **22.** CMIL as a language-focused approach

Chapter 2: published works

THE LANGUAGE FOCUS OF SCIENCE EDUCATION INTEGRATED WITH ENGLISH LEARNING

Valentina Piacentini, Ana Raquel Simões, Rui Marques Vieira
CIDTFF research centre, University of Aveiro, Portugal

ABSTRACT: Global education demands being directed to scientific literacy and language proficiency, research on the school integration of Science and English and on the language focus for Science education is highly relevant. One educational approach is CLIL, aiming both at learners' Content and Language acquisition. The main objective of our work – framed in the socio-constructivism and designed as a case study – is to understand what teaching strategies and classroom interactions have been developed and can be promoted in the "English Plus" project in one Portuguese school to support students, when Science education is integrated with English use. Context characterization shows the importance of developing a language-aware teaching approach to improve the subject education and student learning. To foster that, an instrument has been constructed and is presented here.

KEYWORDS: CLIL, Science education, language-focused, English, Portuguese 7th and 8th grades.

OBJECTIVES: To construct a context-derived instrument for investigating on and supervising teacher planning and classroom practices whereby cross-curricular integration between Science and English has been developed, through a content-based language instruction project in one Portuguese school. Aligning with a socio-cultural perspective, the purpose of narrowing the observation on teacher strategies and interactions in classroom is required to triangulate information gathered and to understand the relationship between Science and the language used in/for/with it, useful for teacher practice orientation and student learning support.

THEORETICAL FRAMEWORK

The emphasis given to Science education is far from supporting learners in extending scientific knowledge over facts and formulas, and developing a scientific literacy to understand scientific information and taking responsible decisions about socio-scientific issues (Vieira, Tenreiro-Vieira, & Martins, 2011). Participation in the real world implies people can communicate, effectively and collaboratively. Little attention is devoted to the significance of language in learning Science and of the range of semiotic modes available to the Science teacher and in Science in general, although for many students to learn its language is the greatest difficulty (Wellington & Osborne, 2001). Science must be "talked", read and written (Sanmartí, 2007) – considering the inextricable linkage between language and conceptual development – then a language-focused Science education is justified. A deeper understanding of the role of multiple representations in developing Science knowledge and literacy is required, as much as orienting teacher education and professional practices (Yore & Treagust, 2006).

For participating in the global discussion, being competent in other languages (even though to varying degrees) is fundamental. Global demand for learning (through) English has been increasing, and English becoming compulsory in 2015-2016 since the 3rd grade in the Portuguese education system is an example. It is the language of the international scientific community, technology and multimedia, often assumed in academic curricula, for professional mobility and cultural encounters. CLIL (Content and Language Integrated Learning) emerges as a solution for European citizens to use and learn foreign languages (FL) and is indicated as one strategy to promote plurilingual and intercultural education (Beacco et al., 2010). It shares theoretical underpinnings and methodological concerns with the Canadian immersion in bilingual education, despite some differences as for instruction language or teaching materials (Lasagabaster & Sierra, 2010).

CLIL classes are authentic learning environments to achieve communicative competence in FL through classroom activities (Dalton-Puffer & Nikula, 2006). As shown in different versions of the CLIL lesson planning, students learn the subject and how to use types of language. According to Coyle, Hood, and Marsh (2010), learning and teaching of Content and Language converge in "a dual-focused educational approach". Working in an additional language, consequent teacher awareness of learner linguistic needs, and learning characteristics implied have prompted the development of quality teaching and learning strategies in CLIL-based education (Marsh, 2012). Indeed, studies on classroom practices report that CLIL settings/strategies can improve Science education (Grandinetti, Langellotti, & Ting, 2013), representing a "change agent" and – in being a language-sensitive teaching – a beneficial preparation for Content teachers who deal with heterogeneous learners-speakers (Wolff, 2012).

PARTICIPANTS AND METHODS

Aimed at creating contexts meaningful and collaborative for teaching/learning of both the specific and linguistic subjects, the Portuguese CLIL-type "English Plus" (EP) teacher initiative (Simões, Pinho, Costa, & Costa, 2013) might promote the development of scientific literacy and the subject-specific multimodality for Science knowledge and communication, in both the mother tongue and the FL. Our study has been designed in 2015-2016 as a descriptive-explanatory case study with embedded units (Yin, 1994), constituted by participants involved in the EP project at different times and levels: the English teacher, who started the project in History in 2010 and coordinator of the current implementation of EP Science, and 2 Natural Science teachers (at 7th and 8th grade); 7th and 8th graders participating in EP (theoretical) Science classes and "project hour" on Science through English; 11 high school (3 areas) students who had EP History from 7th to 9th. Data collection has been performed through: teacher and former student semi-structured interview; current student semi-structured questionnaire; non-structured "at-different-degree" participant observation of classroom practices (roughly 1/w, during 5 months), lesson planning and other moments (phone calls, etc.).

RESULTS

The instrument we introduce here has derived from context characterization: preliminary data analysis (content analysis of observation log, descriptive student questionnaire and interviews) shows, through independent evidences, that a language-aware teaching methodology can improve the discipline education and student learning. Older students identify strategies of teacher mediation (scaffolding, interaction, paraphrase) as possible factors facilitating the specific subject learning in a FL. Also students currently involved in EP Science recommend their subject teachers to support learners with greater scaffolding/structuring of lessons and activity diversification, and report some difficulties in aspects (debates,

concept maps, reading and writing, etc.) of Science learning where language(s) are implied (Piacentini, Simões, & Vieira, 2016). On the other hand, interviewing teachers and observing their planning and practices reveal that they acknowledge the importance of language and communication in Science (1 subject teacher) and of English use for it (language and subject teachers); it is still not perceived the role that other modalities of communicating and organizing Science can have for the language development.

The need for constructing a framework, to observe and interpret classroom practices and multiple dimensions through which the language of Science and its communication/representation modalities are developed in the Science discourse (Scott, Mortimer, & Aguiar, 2006) also through English (Escobar Urmeneta & Evnitskaya, 2014; Morton, 2012), during EP (English and Science coteaching) and non-EP (only Science teacher) Science lessons has thus arisen, resulting in the tool below (Fig. 1, A/H): constructed by the researcher under the orientation of CLIL experts, tested during 2 EP and non-EP classes, discussed with the PhD supervisors and presented in one seminar on educational research. It combines conceptual perspectives, modified/integrated for our purpose. The main structure was inspired by the work of Llinares, Morton and Whittaker (2012) to understand the roles of Language in CLIL and different disciplines. Needless to say, an overlap in the information collected through all parts can be noticed but it will help in matching data from diverse angles.

The "Language use in/and Science learning in interaction" tool

Science classroom discourse (Mortimer & Scott, 2003), A

A referential framework for teachers to understand and develop the role of talk in Science classrooms for achieving pedagogical goals.

Science genres and language-based approach (Polias, 2006), B

The Halliday and Martin's model is used for defining the register through field, tenor and mode. Language is the main resource for making meaning and assessing learning.

Science and English co-teaching in CLIL classes (Valdés-Sánchez & Espinet, 2016), C

One of the few CLIL research contributions from the Science (as opposed to Language) education field, on integrated learning between Science and English. Interaction turns will be plotted on it.

Language demands in Science performance of ESL (Bunch, Shaw, & Geaney, 2010), D

Grounded in functional and interactional views of language use, it focuses on learners not having English as a family language. "Science (education) genres" are organized in domains of activity (Veel's taxonomy).

Teacher scaffolding strategies (Escobar Urmeneta & Evnitskaya, 2014; etc.), E

Adapted from the online Fortune's verbal/procedural/instructional scaffolding techniques for Content Based Instruction, columns include contributions from authors who highlight the importance of interactional resources in CLIL classes that teachers should be aware of in scaffolding the student learning of both Content and Language.

Language-focused Science education (Wellington & Osborne, 2001), F

As these authors remark, to convey meaning not only through the verbal language a combination and interaction of other modalities are used, the Science languages integrated in the third column as resources for learning.

5E instructional model in Science education (Bybee, 2015), G

Developed by Bybee in the '80s and designed to promote a constructivist approach to Science education., it may be helpful in "recording" learners' practice during classes.

Researcher contributions, H.

Relevant episode occurrence; classroom representation; etc

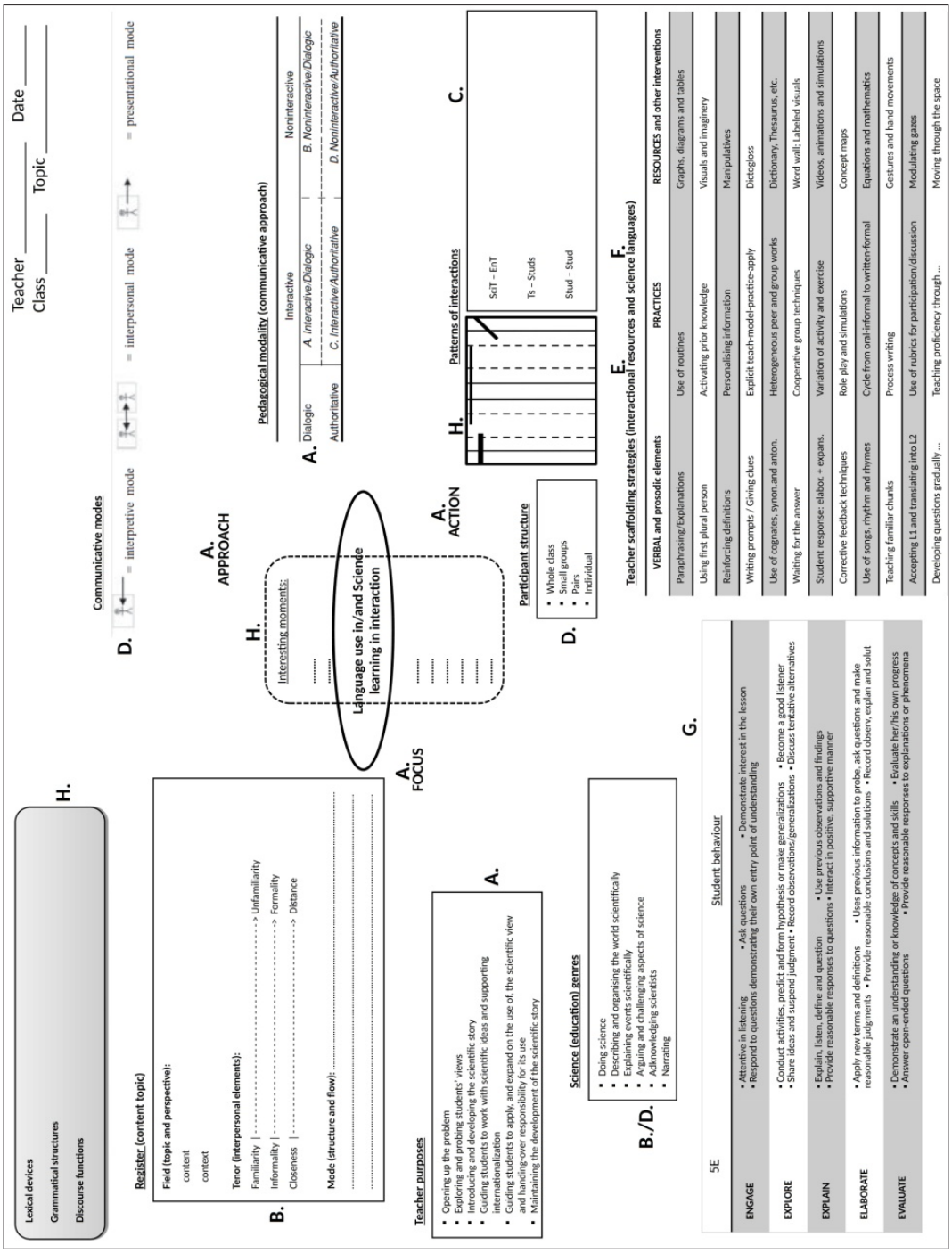


Fig. 1. Research/Teaching instrument

CONCLUSIONS

Due to having an explicit presence of (a foreign) language in the specific subject, CLIL opens a possibility for Content teachers to understand and face the "weight" of language(s) in any curricular topic. Learners dealing with a school language different from the home one have to confront, as any learner does, language demands in disciplines requiring teacher awareness. Students may find difficulties in Science activities involving the use of language and representations; hence their suggestions for teachers to support learning are also related to the way Science knowledge is (re)presented. CLIL may thus be a quality approach for authentic English practice and also a different perspective for Science understanding and contextualization.

The CLIL-type "English Plus" is actually a learning process also for teachers who have a critical approach to their profession, but still need to recognize that Language in Science is fundamental in taking Science education as a learning context for developing literacy beyond classes of students' mother tongue and/or literature. Deriving from characterization of participants, the described instrument offers an opportunity to record and reflect on classroom practices in which Science education is integrated with English use/learning, within this EP programme.

However, more endeavour in our research is required to understand the suitability of English as a language and method for scaffolding Science learning and to refine the tool itself. Further collaboration with participant teachers will be sought – through a focus group and other supervising moments in which to use the above framework – to identify and benefit from issues and strategies pivotal for this educational integration.

ACKNOWLEDGMENTS

This work is financed by national funds through the FCT – Fundação para a Ciência e a Tecnologia, I.P., under the PhD grant SFRH/BD/102895/2014 and within project UID/CED/00194/2013.

REFERENCES

Beacco, J.-C., Byram, M., Cavalli, M., Coste, D., Cuenat, M. E., Goullier, F., & Panthier, J. (2010). *Guide for the development and implementation of curricula for plurilingual and intercultural education*. Strasbourg.

Bunch, G. C., Shaw, J. M., & Geaney, E. R. (2010). Documenting the language demands of mainstream content-area assessment for English learners: participant structures, communicative modes and genre in science performance assessments. *Language and Education*, 24(3), 185–214.

Bybee, R. (2015). The BSCS 5E Instructional Model: Creating Teachable Moments. Arlington: National Science Teachers Association.

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

Dalton-Puffer, C., & Nikula, T. (2006). Pragmatics of content-based instruction: Teacher and student directives in finnish and Austrian classrooms. *Applied Linguistics*, 27(2), 241–267.

Escobar Urmeneta, C., & Evnitskaya, N. (2014). "Do you know Actimel?" The adaptive nature of dialogic teacher-led discussions in the CLIL science classroom: a case study. *The Language Learning Journal*, 42(2), 165–180.

Grandinetti, M., Langellotti, M., & Ting, Y.-L. T. (2013). How CLIL can provide a pragmatic means to renovate science education – even in a sub-optimally bilingual context. *International Journal of Bilingual Education and Bilingualism*, 16(3), 354–374.

Jobrack, B. (n.d.). The 5E Instructional Model Engage Explore Explain Evaluate EXTEND. STEM, *White Paper*, 1–11.

Lasagabaster, D., & Sierra, J. M. (2010). Immersion and CLIL in English: more differences than similarities. *ELT Journal*, 64(4), 367–375.

Llinares, A., Morton, T., & Whittaker, R. (2012). *The Roles of Language in CLIL*. Cambridge: Cambridge University Press.

Marsh, D. (2012). *Content and Language Integrated Learning (CLIL) A Development Trajectory*. Cordoba: Servicio de Publicaciones de la Universidad de Córdoba.

Mortimer, E. F., & Scott, P. H. (2003). *Meaning Making in Secondary Science Classrooms*. Maidenhead: Open University Press.

Morton, T. (2012). Classroom talk, conceptual change and teacher reflection in bilingual science teaching. *Teaching and Teacher Education*, 28, 101–110.

Piacentini, V., Simões, A. R., & Vieira, R. M. (2016). Abordagem holística no sistema educativo português para desenvolver a(s) Literacia(s) das Ciências integradas com o Inglês. *Indagatio Didactica*, 8(1), 1975–1992.

Polias, J. (2006). Assessing learning: a language-based approach. *Symposium*, 40–65.

Sanmartí, N. (2007). Hablar, leer y escribir para aprender ciencia. In P. Fernández (Ed.), *La competencia en comunicación lingüística en las áreas del currículo* (pp. 103–128). Madrid: MEC.

Scott, P. H., Mortimer, E. F., & Aguiar, O. G. (2006). The Tension between Authoritative and Dialogic Discourse: A Fundamental Characteristic of Meaning Making Interactions in High School Science Lessons. *Science Education*, 90(4), 605–631.

Simões, R. A., Pinho, S. A., Costa, M. A., & Costa, R. A. (2013). The Project English Plus: a CLIL approach in a Portuguese school. *Indagatio Didactica*, 5(4), 30–51.

Valdés-Sánchez, L., & Espinet, M. (2016). *Una herramienta para el análisis de la colaboración docente en la integración de las ciencias y el inglés en el aula de primaria: la docencia compartida como herramienta innovadora de integración disciplinar*. Badajoz.

Vieira, R. M., Tenreiro-Vieira, C., & Martins, I. P. (2011). *A Educação em Ciências com Orientação CTS. Atividades para o ensino básico*. Porto: Areal Editores.

Wellington, J., & Osborne, J. (2001). *Language and Literacy in Science Education*. Buckingam/ Philadephia: Open University Press.

Wolff, D. (2012). The European framework for CLIL Teacher Education. *Synergies Italie*, 8, 105–116.

Yore, L. D., & Treagust, D. F. (2006). Current Realities and Future Possibilities: Language and science literacy—empowering research and informing instruction. *International Journal of Science Education*, 28(2-3), 291–314.

Final proof of Piacentini, V., & Simões, A. R. (2020). In F. Anastassiou & G. Andreou (Eds.). *English as a foreign language: Perspectives on teaching, multilingualism and interculturalism* (pp. 54-83). Cambridge: Cambridge Scholars Publishing.

CHAPTER FOUR

CLIL: A WAY TO DEVELOP PLURILINGUAL AND INTERCULTURAL COMPETENCES IN SCHOOLS?

VALENTINA PIACENTINI AND
ANA RAQUEL SIMÕES

1. Introduction

1.1 An overview about the CLIL approach

First coined by Maljers and Marsh in 1994[1], the idea of "Content and Language Integrated Learning" (CLIL) arose in the '70s and '80s from immersion programmes in Québec. The term used in French is EMILE (*Enseignement d'une Matière par l'Intégration d'une Langue Etrangère*) and the Spanish version is AICLE (*Aprendizaje Integrado de Contenidos y Lenguas Estranjeras*). All acronyms are associated to "any dual-focused educational context in which an additional language, thus not usually the first language of the learners involved, is used as a medium in the teaching and learning of non-language content" (Marsh, 2002: 2).

In 2002, it was estimated that the CLIL approach in Europe involved about 3% of schools (Marsh, 2002), but the number has been increasing significantly. According to Eurydice Report (2006, commenting on 30 European countries), in most countries, the languages that are taught within CLIL are either foreign languages, as the case in Austria, France, Spain or United Kingdom, or other official state languages (Finland, Italy,

[1] The relevant interview can be retrieved from www.tesol-spain.org/uploaded_files/files/Leonor-Martinez_The_Essence_of_CLIL-Interview_with_David_Marsh.pdf

etc.). There are also cases of the use of minority languages, for example Breton, Catalan, Occitan in France, Russian in Estonia, Ukrainian in Romania or Sami in Finland, Norway and Sweden. In some cases, certain minority languages are a majority language in neighbouring countries (the Slovenian in Austria, which is a majority language in Slovenia). It is also clear that English is the most common language used in this approach.

In terms of school levels, CLIL is offered at both primary and secondary schools in a large number of countries; programmes and activities in a foreign language also exist at preschool level in some countries (Belgium, Finland, Italy, Romania, Spain and United Kingdom). Nowadays, the CLIL methodology is also widely used at the tertiary level and in adult learning (Eurydice Report, 2017). Any curricular subject may be targeted by CLIL, albeit, at high school grades Mathematics, Sciences, Geography, History and Economics tend to be preferred in this provision. Over the last ten years, CLIL projects and initiatives have been also growing in countries not identified before, such as Cyprus, Denmark or Portugal. When considering the use of the CLIL concept for the very different approaches listed in the above-mentioned 2006 report or for the CLIL implementation models outlined by Coyle (2005), it is clear that CLIL is flexible and there is no formula for the organization of such initiatives (Lasagabaster, 2008), which calls for conceptual clarification (Dalton-Puffer, 2007).

Since 1995, with the White Paper on Education and Training, the importance of European citizens becoming competent in European languages besides their own is revealed. CLIL was listed, in 2003, as one of the methods to improve language teaching in the Action Plan for language learning and linguistic diversity, created by the European Commission. Numerous other recommendations have shown the importance of developing plurilingual and intercultural competences and CLIL is indicated by Beacco and colleagues as one of the possible strategies to promote plurilingual and intercultural education (2010). Furthermore, it is recognized as one possible initiative for language education in Europe, together with intercomprehension and other propaedeutic approaches, in the 2011 Civil Society Platform on Multilingualism. Therefore, CLIL emerges as a European solution for advancing foreign language (FL) learning.

Though sharing theoretical underpinnings and methodological concerns with the Canadian immersion in bilingual education (Evnitskaya and

Morton, 2011), differences have appeared over time in CLIL programmes: for instance, the "non-nativeness" of teachers and students or readapted/scaffolding teaching materials (Lasagabaster and Sierra, 2010), or the degree of collaboration between language and non-language teachers (Pavón Vázquez and Ellison, 2013). Based on Cenoz (2015), CLIL also shares essential properties with CBI (Content-Based language Instruction), differing characteristics being due to specific educational contexts. CLIL is assumed as an alternative to Communicative Language Teaching (Coyle, Hood and Marsh, 2010) or a way of extending it (Dalton-Puffer, 2007; Lasagabaster and Sierra, 2010).

According to the Krashen's 1982 theory on Second Language Acquisition, languages are learnt while they are used. If students are not exposed in their daily lives to the FL they are learning at school, the effort invested can be wasted (Langé, 2002). CLIL classes are authentic learning environments to achieve "communicative competence in the target language through […] everyday classroom activities" (Dalton-Puffer and Nikula, 2006: 241). Since the FL is used for learning content, learning and using a language are simultaneous (Ting, 2010). As opposed to traditional FL classes where the form and structure of a foreign language are the main object of knowledge construction, within CLIL settings the mastery of Content (non-language, specific subject which is represented through language) and the acquisition of Language are a "dual focus" of both teaching and learning, according to referential conceptualizations of CLIL as an educational approach (e. g., Marsh *et al.*, 2011 and Coyle *et al.*, 2010). Previous CLIL studies have indeed shown that students' attitudes and motivation towards language learning, among other cognitive gains (Pavón Vázquez and Ellison, 2013), as well as foreign language skills (Dallinger, Jonkmann, Hollm and Fiege, 2016; Koller, Leucht, and Pant, 2012) benefitted from CLIL.

As stated by Pavón Vázquez and Ellison, "there is no template for planning CLIL lessons, because each subject and context is highly unique" (2013: 72), but in the CLIL-4Cs Framework it is highlighted that the interrelationship between the 4Cs may lead to effective CLIL (Coyle *et al.*, 2010: 53-56): students learn the subject or a theme (**C**ontent, to be understood as new knowledge, skills and understanding) and related **C**ultural and academically specific issues, with the **C**ognitive processes involved; at the same time, they **C**ommunicate and learn how to use the

languages OF, FOR and THROUGH learning[2] (the so called "language triptych", cf. Coyle). In making the language use authentic for the specific need to understand content and to construct meaning (Coyle *et al.*, 2010), CLIL promotes speaking not from the teacher but from the learner, who thus becomes central in the learning process (Ting, 2010).

Hence, one may also state that quality CLIL implementation fosters learner autonomy and cooperative learning, self and peer formative assessment and requires intention and process visibility (Mehisto, 2012), as well as the development of a "language-supportive pedagogy" (Clegg, 2007) also through a diversity of teacher scaffolding strategies. Actually, challenges encountered using an additional language increase teacher awareness of learner linguistic needs (Blanchard, Masserot, & Holbrook, 2014; Marsh, 2012) and "may favour a more profound treatment of content" (Escobar Urmeneta and Evnitskaya, 2014: 178). Major difficulties are caused not by using a foreign language, but by the methodology or lack thereof used in CLIL classes (Barbero, 2006). Time is, in fact, one of the constraints identified in several studies on the provision of language learning methodologies. Milton and Meara (1998), for instance, agree that learners do not have sufficient time to apply what they have learned. This idea is also portrayed by authors more specifically focused on CLIL programmes (Beacco *et al.*, 2010; Coyle *et al.*, 2010; Marsh and Langé, 2000). Curriculum and policy constraints, as well as restrictive existing material, are other obstacles described by Coyle and colleagues (2010).

In defiance of these aspects, CLIL is acknowledged as a "change agent", in converting "monolingual learning contexts into bilingual experiences" and moving "towards a more equitable distribution of linguistic and social capital" (Coyle, 2013: 244–245). CLIL is also a "change agent" in entailing "language-sensitive content teaching" strategies favourable for preparing CLIL and non-CLIL teachers who work in CLIL-like contexts in European schools; actually, due to the increasing migratory phenomena,

[2] OF: specific subject language [key lexis and phrases, as well as grammatical structures and discourse functions associated with the theme (to define, to explain, to report, etc.), which the learner needs for knowing how to use thematic words]. FOR: general academic language students have to learn for operating effectively in a CLIL unit (to present a project, to work in groups, etc.), not varying from one subject to another one. THROUGH: not possible to foresee by the teacher but emerging when the learners neither have it nor possess the resources to produce it; important for recycling and extending the student's repertoire.

conversational and academic competence levels[3] in the schooling language among learners are heterogeneous (Wolff, 2012). However, "[equipping] CLIL teachers to bear the challenge of that change" is unquestionable (Pérez Cañado, 2016: 217), as much is as the need for a CLIL teacher to have her/his own intercultural competence developed (Michael Byram, 2008; Campos, 2009), which are challenges to confront for a quality CLIL-based education.

1.2 Intercultural potential of the CLIL approach

CLIL, as are other Competency-Based Language Teaching approaches, is recommended by Council of Europe publications, such as the Common European Framework of Reference for Languages (CEFR) (Council of Europe, 2001). By merging a FL with subject matter, CLIL may consist of an ideal context for intercultural learning, since content is never culturally neutral (Sudhoff, 2010). Other researchers emphasise that, if intercultural learning is treated as an educational objective, CLIL may be a suitable methodology (Bernaus, Furlong, Kervran and Jonckheere, 2012; Breidbach, 2007; Campos, 2009; Wildhage and Otten, 2003). It is yet not clear if the CLIL methodology indeed develops individuals' plurilingual and intercultural competence in a wider perspective, since studies have been focused on the particular combination of languages that the projects offer. Nevertheless, there are some studies that have shown the potentialities of CLIL projects as a framework for the implementation of interculturally-oriented methodological approaches, contributing to the development of students' intercultural communicative competence (García, 2013).

In an Andalusian context, another project comparing CLIL and non-CLIL primary students concluded that the pupils enrolled in CLIL projects revealed a higher intercultural competence, especially in terms of knowledge and attitudes ("existing differences are of great importance and implicative"), even though it can be improved (Antequera, 2016: 66). Despite this fact, work has still to be done, even with CLIL teachers, in

[3] BICS (Basic Interpersonal Communication Skills) and CALP (Cognitive Academic Language Proficiency) dimensions (cf. Cummins, 1987). The former are the communicative skills which almost all native speakers have; they are used in oral communication even though they can also be found in written form, for example in email communication. The latter, on the other hand, is the proficiency necessary to master the formal language registers, among others also the language of education or schooling.

order to develop their understanding of intercultural and plurilingual competence and its articulation with CLIL. Actually, as noticed by Pérez, Gómez and Serrano, "not many teachers have an idea of what IC [intercultural competence] is and how they can help students achieve it, but […] their perspective is mainly language-oriented (linguistic and communicative skills) instead of seeing this competence as a cross-curricular one" (2017: 97). On one hand, the development of learners' intercultural competence can be seen as an "additional demand on already busy teachers" (Koro, 2017: 58), on the other hand, teachers and learners might not be motivated to consider its acquisition as important as that of linguistic and communicative competences, if IC is not integrated in formal assessment (Aktor and Risager, 2001).

Some authors (e. g., Koro, 2017 and Sudhoff, 2010) believe that the engagement of stakeholders (CLIL curriculum designers, authors of CLIL textbooks and materials, CLIL teacher trainers, and CLIL teachers and learners) is fundamental for CLIL methodology implementation to effectively promote the students' intercultural understanding. For all these reasons, "What plurilingual and intercultural implications are encountered by participants who had more contact with English through the teaching and learning of specific subjects within one Portuguese CLIL project at lower secondary school?" is our research question. Objectives of the present work are: the understanding of the position of CLIL language teachers and CLIL students – with different levels of experience and awareness – with respect to (the project language) English and (contact with) other languages and cultures; the identification of contexts and aspects of the learner experience that might foster more plurilingual and intercultural teaching practices through English in language and project classes.

2. The empirical study

2.1 English education in the Portuguese school system

Portuguese compulsory education is divided into the 1st cycle (from the 1st to the 4th grades, ages 6-9), 2nd cycle (from the 5th to the 6th grades, ages 10-11), 3rd cycle (from the 7th to the 9th grades, ages 12-14) and secondary education (from the 10th to the 12th grades, ages 15-17). As thoroughly described by Lourenço and Mourão (2017), concerning foreign language education, since 2012 English has been the only foreign language taught/learnt in the 2nd cycle, with French, German and Spanish becoming

choices only in the subsequent cycle. It was in the 2015-2016 school year that English was introduced as a compulsory subject from the 3rd grade, implying changes in the curriculum and syllabus development as well as a clearer teacher education background. In the 2nd and 3rd cycles, English is provided for an average time of 90-120 minutes per week and its education might continue until the 11th grade at secondary school, regardless of the subject studied. Nowadays, students learn a second FL (French or Spanish) only from the 7th grade on.

English is also the FL mainly selected as the Language for CLIL programmes at compulsory school levels (European Commission, 2017), which are still represented by individual examples in Portugal. The top-down *Programa Escolas Bilingues em Inglês* / Bilingual Schools Programme[4] (organised by the Ministry of Education and the British Council in Portugal and currently involving 25 state school clusters) integrates English into the daily activities of pre-primary school levels and English with different disciplines of primary school up to the 9th grade. On a different level of CLIL provision, there are also bottom-up teacher initiatives such as the ongoing "English Plus" (EP) project at lower secondary levels (3rd cycle) of one state-run school in North Portugal that we introduce and describe in this chapter.

2.2 The "English Plus" project in the local school

Its first edition was undertaken by (English and History) teachers with one class between 2010 and 2013, and monitored by researchers of the CIDTFF of the University of Aveiro, with regard to stakeholders' perceptions (Simões, Pinho, Costa and Costa, 2013). The same English teacher who introduced and developed this educational integration with History reactivated the project in 2014-2015 as "English Plus" of Natural Sciences, involving one Science teacher, and coordinated a new collaboration with the same research centre since 2015-2016, the year of our empirical study in the school (Piacentini, Simões and Vieira, 2016, 2017, 2018). During this year, out of 20 classes in the school, two at 7th grade, two at 8th and one at 9th were involved, along with two Science and two English teachers in the EP project.

[4] For further information see www.dge.mec.pt/programa-escolas-bilinguesbilingual-schools-programme.

EP students had, weekly: 45 minutes of History or Science with English (co-teaching: both the subject teacher and the English one were present and using English), 45 minutes of same subject held mainly in Portuguese (classes were given by the non-language teacher alone) and 45 of "project time" (PT: English on socio-cultural subject-related topics with the English teacher); 90 + 45 minutes of classes of English as a FL (with the same language teacher, following the standard curriculum). Project students were usually "engaged" in extra-curricular activities, as observed during the empirical study and revealed by teacher and student interviews: school trips to other countries or to educational organizations, as well as their organization (involving also parents); cinema sessions (with movies in English related to History or Science topics) and theatre performances (creative History or Science using English); activities with LALE university laboratory[5]; "open day", etc.

According to the Content topic, subject teachers could choose suitable units to teach by means of English, rather than covering the whole curriculum. Teachers involved in this project had co-planning (subject and language teachers working together on EP and PT implementation and material construction/revision) available once per week in their timetables; if that was not possible, extra email exchange and short meetings among colleagues occurred, as observed several times. No financial reward was provided to EP teachers.

2.3 Case study and participants

There is no objective social reality that we can capture as educational researchers, since we construct reality according to our personal experience and considering multiple perspectives of participants involved (Lodico, Spaulding and Voegtle, 2006), therefore we align with the interpretive paradigm. Within our doctoral research, in 2015-2016 we designed a descriptive-explanatory case study with an ethnographic approach (White, Drew and Hay, 2009), in response to the researcher's need for familiarization with the school and project context. Hence, an extensive observation was performed, and teachers and students, associated with the (History or Science) EP project at different times and levels, were "embedded" as subunits of analysis of a single case (Yin, 1994).

---

[5] *Laboratório Aberto para a Aprendizagem de Línguas Estrangeira* – Open Laboratory for the Learning of FL , https://www.ua.pt/cidtff/lale/.

In this specific work we focus on the voices of the two project English teachers (Eng-old and Eng-new) and former and current EP students. The English teacher of former and current students (Eng-old) had played a pivotal role in the programme evolution, also "tutoring" (through PT classes) another English colleague (Eng-new) who had her own EP class in 2016-2017. Eleven high school students, who had had EP-History in 2010-2013, were the former students; 96 lower secondary graders attending EP-Science in the same year of our study (2015-2016) were the current students.

Talks with Eng-old allowed for the selection of the 11 ex-EP students with the following characteristics: attending high school (12th grade) in fields roughly proportional to those chosen by all 25 students from the 2010-2013 EP class; being heterogeneous in terms of performance at the previous (lower secondary) school. Our sample of former students is, thus, composed of 6 students from Science (sSci-1, sSci-2, sSci-3, sSci-6, sSci-7 and sSci-11), 4 from Economics (sEcn-4, sEcn-5, sEcn-8 and sEcn-9), and one from Humanities (sHum-10). Regarding the current EP students, teachers suggested the exclusion of the 9th grade group because it was not regularly provided with the EP project. As for the 7th and 8th graders, they were in their first and second year of attendance, respectively, of EP at the time of our study.

2.4 Data collection and analysis[6]

Throughout the PhD empirical study, we collected data through a diversity of techniques: teacher and former student interview; current student questionnaire; "at-different-degree" participant observation of classroom practices (roughly 1/w, during 5 months), lesson planning and other contexts (non-formal chats, phone calls, etc.); collection of school and teacher documents.

Recalling that our research question is "What plurilingual and intercultural implications are encountered by participants who had more contact with English through the teaching and learning of specific subjects within one Portuguese CLIL project at lower secondary school?", in this chapter the main corpus of analysis is (selected questions from) the current student

[6] Complete data of the whole study are in the process of being analysed and will be presented in future works; some of the partial results are already published in referenced works.

questionnaire as well as the former student and teacher interviews. The information from the teacher source is complemented with data resulting from secondary methods (in this case, observation). Questions asked to participants and their responses, within the discussion of results, are typed in italic and have been translated from Portuguese by the researcher. Personal information is kept confidential.

Because of the large number of current students, we designed a semi-structured questionnaire guide. It was validated, independently, by two experts (from both Language and Science education research fields), piloted on one 7th grade class (involved in a similar project to EP in the same school district), checked by teachers and administered through a Google Drive form to 7th graders (44 responses) and 8th graders (52 responses) at the end of the first term. We developed, in Portuguese, 21 questions (11 close-ended and 10 open-ended) aimed at understanding the students': school profile; language repertoire; experience with "Science + English" out of school; relationship with (the learning of) English and languages as well as with Science; difficulties encountered in Science classes; suggestions for Science and English teachers to improve the learning; opinion about the project, its advantages and obstacles. We performed descriptive statistical analysis through the SPSS 21 software on the closed-ended answers; categories were formed inductively through Atlas.ti 6 from the open-ended answers and resultant coding was analysed within an already existing construct (see 3.2 below). For the purpose of this work, answers on the student's language repertoire and her/his relationship with languages and English will be presented.

Taking into account the maturity and small number of former students, a semi-structured interview guide was constructed, together with their 7th, 8th and 9th grade English teacher (Eng-old), in order to understand: the learner's opinion about the project; difficulties encountered and overcome as well as suggestions for current EP students; subject benefitting from this educational combination; differences between co-teaching and single-teaching; situations in which the use of English could have facilitated the learning process compared to Portuguese; possible benefits for the study of Science at high school; learning of English and desire to know other languages and cultures. This last field was selected as an interesting aspect for the present discussion. With the interviewees' oral consent, we interviewed and audio-recorded students at the end of the 2015-2016 school year, at school during gaps they had from lessons, using their mother tongue (Portuguese) so that they felt comfortable in understanding

questions and expressing themselves. Qualitative content analysis procedures were performed on transcribed interviews.

EP teachers were interviewed, in a meeting room at school before the start of the 2015-2016 year, with a process similar to the student interview in terms of: use of their mother tongue during the interview, audio-recording, transcription and analysis. We developed one semi-structured guide for the Science teachers (Sci-old and Sci-new) and one for the English ones (Eng-old and Eng-new), both guides converging in: their teacher education and work as a teacher; position about Science teacher being also a Language teacher[7]; strategies and resources used in classroom practices and socio-cultural implications of their subjects; relationship between Science and English at school; questions connected with their knowledge/experience with the CLIL or CLIL-type approach. Due to the nature of this chapter and to the relevance of data, only the English teachers' answers about the role of English in plurilingualism will be presented and discussed. In the three cases of content analysis of open-ended and interview answers, coding was examined by experts in related fields.

3. Discussion of results

3.1 Contact with languages in everyday life (current students)

From the analysis of current students' language repertoire (question: *language(s) you have contact with out of school*; semi-closed answer: languages selected from and added to a list, within a diversity of contexts), English is the language they mostly have contact with. Its presence in different contexts of learners' life is unquestioned (Figure 1). Actually, on average students mention English in 5-6 contexts out of 8.

[7] The original statement is "Science teachers are (among other things) Language teachers" from the introduction to *Language and Literacy in Science Education* by Wellington and Osborne (2001).

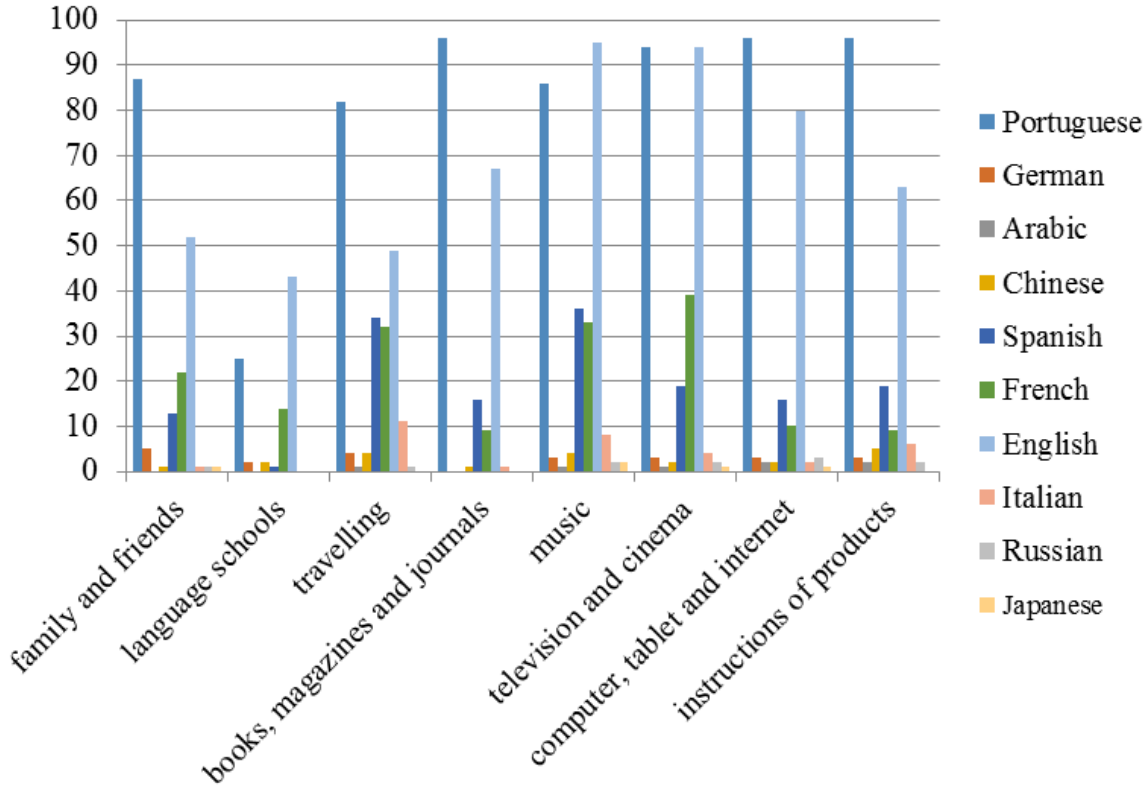


Figure 1: languages contacted by students in contexts of their lives; absolute frequency values.

Only a few students have access to (English and French) language schools. Many of the other contexts are also referred to as factors of the importance of language learning or as aspects they like about English (as described in section 3.2): possibility of communication (both at home and travelling, with strangers but also among people close to students), access to information (concerning products or in magazines, etc.), entertainment (music, TV, computer, etc.).

French and Spanish are other languages significantly represented. Besides being the second foreign language learnt at school, French is the native language of many countries where Portuguese people tend to emigrate (France, Belgium, Luxembourg, etc.), a fact implying a contact with this language through travelling and (visiting) relatives. Students also report television and cinema as well as music, probably as a reflection of the interest shown in Portugal for the French culture. Spanish is spoken in the neighbour country, where travelling is relatively easy for Portuguese people, and it is the language of much contemporary "catchy" pop music.

Other languages, such as Italian, are mentioned in only a few contexts, as a language encountered in trips, music and some products. German and

Chinese show a similar sporadic presence, which differs from ex-EP students who have learned some German for a school trip or chose to study Chinese at school. It is worth saying that most of the times, when students had to add a language not found in the list provided to them for each context, they put Japanese (in music but also in television, computer and with known people). Portuguese is, obviously, heavily present in all contexts, but it is not included in the graph for a more convenient visualization.

In spite of the strong presence of English in the student's everyday life, other languages are also contemplated, including their own, and some contexts appear to be more "plurilingual" than others: on average, almost 3 languages are identified in music and television, followed by travelling occasions, multimedia use and printed material. We consider that this finding should be taken into account in teaching practices aimed at a "meaningful and plurilingual" English learning, in which the English language may support and reinforce the contact with other languages and cultures (Melo-Pfeifer, 2014; Smokotin, Alekseyenko and Petrova, 2014), as clarified in section 3.3 by the voices of students with a longer and deeper experience with the "English Plus" (EP) project.

3.2 Relationship with English and other languages (current students)

Students' answers to both questions (*learning foreign languages is important because ...* and *what I like most about English is ...*) were split in sub-answers to code and identify every possible aspect connected with "Importance of foreign language (FL) learning" and "Positive aspects of knowing English (EN)", in the learners' opinion (Tab. 1). The total does not equal, thus, 96 (44 7th graders + 52 8th graders); also, some answers were excluded for being unclear or idiosyncratic. Inductively coded answers are organised through the dimensions of Gardner's construct of motivation to second/foreign language learning [(A) and (B)], revisited by Dörnyei (1998). Answers to the second question tend to present reasons for appreciating English, which can also be interpreted within dimensions of motivation constructs (cf. Dörnyei, 1998). The noticeable eloquence in answers to the first question (greater number of sub-answers, and of words, not shown here) may be explained by the importance of learning languages possibly making students reflect through a wider perspective than when thinking of specific aspects they like about English.

DIMENSIONS	Importance of FL learning	tot FL	Positive aspects of knowing EN	tot EN
(A) cultural /affective	• for travelling, also abroad (24) • to have contact with people (19) • for one's broader learning (16) • for entertainment (3)	62	• entertainment (41) • the language itself (22) • contact with people (18)	81
(B) instrumental /pragmatic	• for people who emigrate (22) • to get a job (12) • for one's future (11) • for use at work (8) • for everyday use (8) • to study, also abroad (7)	68	• its everyday use (7)	7
(C) self-concept-related	NO EVIDENCE	0	• easier communication (11)	11
		130		**99**

Table 1: coding of answers to two questions (see text); numbers in brackets are occurrences of students' quotes; tot FL is the total number of answers about importance of FL learning and tot EN of answers about positive aspects of knowing EN.

When asked about the importance of learning foreign languages, the integrative (A) and instrumental (B) dimensions of answers, are equally covered. The second one is mainly linked to the professional sphere; the idea of emigration and going abroad for getting a job is a phenomenon very frequent in the Portuguese population, and many students have relatives abroad, as stated above. By the way, as defended by Gardner and MacIntyre (1993), motivation is dynamic and is an interplay between the usefulness of foreign languages for professional achievements, for example in cases of emigration, and the desire for understanding and integration with another community, for example where emigrants end up living. The integrative (cultural/affective) dimension of the importance of languages is constituted, among these students, by communication with *people from other countries* or *cultures*, *foreigners*, etc. (Otherness, of

which students are aware), at home in Portugal but also while travelling or going abroad, possible through language learning. This last is assumed to have also an intrinsic value and to contribute to personal development (*for our greater knowledge* or *education*, *to open ourselves to other learning possibilities*, etc.).

Since students were asked to tell what they like about English, their answers coded as "entertainment" (to listen to music, to watch television, to read books, to play videogames, etc.) should be associated with the first dimension, even though some responses report the pragmatic value of English for accessing the lyrics and message of a (favourite) song or watching (and appreciate) a movie without *always resorting to using subtitles*, which accompany Portuguese people's entire lives. Learners appreciate English also because it enables them to communicate with and get to know foreigners as well as to communicate *in a different way* with known people. This feature has to do with students attending the EP project and being members of a group where they might speak and enjoy speaking English, also outside project classes. This integrative dimension is highly represented also through an affective side for the language itself, because they like a diversity of aspects about English (sound, lexicon, etc.), they like to speak English and to have it at school.

Therefore, when students relate aspects they appreciate about knowing English, the integrative dimension becomes very significant mainly through a (cultural) interest towards movies and music, but also for English itself and possibilities of contact with people. However, another component emerges here, (C), since students add the idea of satisfaction from the ease of English (*the way [English speakers] simplify how things are said*), to master and be able to speak it (*to be able to speak a foreign language with a certain ease*), which contributes to their self-concept. Assuming a mechanism similar to the one expressed by older learners below, this first contact with English, reinforced by participation in the "English Plus" project, could increase self-confidence in the process of learning other languages – Pavón Vázquez and Ellison summarised this as "social benefits" (2013) – and might represent a fruitful environment for plurilingual and intercultural teaching practices.

Students' awareness of their linguistic and communicative repertoires, along with affective dimension of languages within plurilingual competence (Andrade *et al.*, 1993; Mons, Simões and Andrade, 2018),

seems to be present in results emerging from current students, described here and in section 3.1.

3.3 English as a "bridge" to other languages and cultures (former students)

The questions *Would you like to or do you know other languages? Which ones?* and *Do you think that English (the fact of learning/using this language within the project) awoke your curiosity about studying/learning other languages and cultures? How?* were asked to these high school students, who participated in the 2010-2013 EP project. Significant examples of coded answers to the second question are shown in Tab. 2 and commented in the text.

English and contact with other cultures and languages	English and personal development
No influence on this contact **sSci-2a:** *I think that when we learn a language it is this language this culture that we are learning about [in our case, English] it could awake the desire to but it's not directly related in my opinion […] people working in different fields […] more in the past always spoke 7 languages, nowadays just English but I would like to be able to speak 7* **Acquaintance with other cultures** **sSci-3a:** *to help anyone from a different place from a different culture in the street […] communication in English is always easier than in Portuguese also because many people don't speak Portuguese* **sEcn-5a:** *my cousins are from France […] I speak English with them […] when they come to Portugal […] they try to speak French [to me] but also I don't know much* **sSci-6a:** *it's an important tool because English […] is the universal*	**First positive experience** **sSci-2b:** *learning a language and mastering it gives us the idea we can learn more and that actually […] we are able* **sEcn-4:** *starting with English [...] encouraged me to learn other languages because at the end difficulties always bring some benefits* **sEcn-5c:** *I thought [...] it was not possible to speak a language other than Portuguese which is our language [but] with English I started [...] to realise that it is possible and it's not that difficult* **Broadening of knowledge** **sSci-3b:** *it makes us want […] to know more and we feel at ease with other cultures […] the more we know the better […] and it is enriching* **sSci-7:** *[English] was totally different from Portuguese [...] it always awakes that curiosity to understand if other languages [and cultures] are also that different [...] and to learn*

language and enables us to communicate with other people who do not speak our language […]. We went to Austria […]. We didn't speak [any] German **sHum-10a:** *I'd like to visit India but […] if they spoke only Hindi I would not understand anything. But [the fact that] they speak English arouses more curiosity to know the country* **Learning of other languages** **sHum-10b:** *I have an interest in these ethnic languages, in Africa for instance there are many and I would like to learn even just one, [English with languages] helps a lot because it has a certain connection* **sSci-6b:** *[English through the project] gave me access to new stuff [...] facilitating the acquisition of information* **sSci-1:** *when I go to university I will take an extra German course and if it was not thanks to English maybe I would never take it […] in terms of job […] it's important we don't focus just on English but on other languages in general* **sEcn-5b:** *in the 7th, 8th and 9th grades we had French but I didn't really like [...] it [now, after the project] I would like to learn for example Mandarin because I know it's a language [...] in the economic field [...] very important in the future*	*more about these languages* **sEcn-9:** *the Project […] awoke my interest in coming to know […] to learn other languages because at the end it's always different from ours [...] We learnt other things that here we don't learn and the project [...] helped us to broaden our horizons*

Table 2: main fields of coded students' answers to one question (see text) and examples of quotes; letters after the student code are used when more than one quote from the same student is shown.

The majority of students learned French as a second foreign language in lower secondary grades, and are motivated to learn or know better many other languages: European (German, Italian, etc.) and non-European ones (Mandarin, Japanese, etc.). On the other hand, some students do not

consider their participation in the project as the reason for wanting to know cultures whose language is other than English. For one of them (sSci-2a in Tab. 2), the interest in other languages/cultures is not directly caused by having been exposed to English and having learned about different English variants (American, British, Australian), instead, it seems to have been caused by their desire and determination (in this case, to personally aim at learning 7 languages). Similarly, two other students do not acknowledge the English language as a "bridge" to other cultures, since the EP project allowed for a contact mainly with England and United States.

Nevertheless, for more than half of the former students the exposure to English through the project has certainly fostered their curiosity for other cultures and provided actual means to communicate with people whose mother tongue is not Portuguese. In speaking English as a common language, EP learners state that they are able to: interact with and help people (sSci-3a, Tab. 2); communicate with relatives who live abroad (sEcn-5a, Tab. 2); travel, get closer to people, explore and understand the country (sSci-6a and sHum-10a). Despite a certain degree of practicality, some of the examples aligned with the integrative dimension in the previous section are expanded here with interesting details, which clarify the role of English for intercultural opportunities (Jenkins, 2015). Furthermore, the following contributions might "dissolve" the cautious opinion of one language teacher in section 3.4 as to whether English promotes plurilingualism or not, as also questioned by Crystal (2003).

For other students, the acquaintance with English helped the development of skills and methods to learn other languages such as French and can facilitate the learning of Korean, online resources being also available in English, or of African ethnic languages, to which English is connected in some way (sHum-10b in Tab. 2). Being able to speak English also gives access to broader information, in sSci-6b's opinion. Moreover, English is referred to as making students aware of the importance of learning other languages, also for the professional sphere (sSci-1 or sEcn-5b, Tab. 2). Curiously, compared to younger students, only two of these learners relate the possibilities for entertainment, such as listening to music or watching videos, offered by knowing English, likely because they were engaged in other contexts such as trips abroad, extra study, etc.

Different mechanisms experienced through English learning contribute to the student's personal development, and to the self-concept related

dimension. On the one hand, self-confidence in the capability for FL learning has grown from the first positive contact with English, as made explicit by sSci-2b, sEcn-4b and sEcn-5c (see Tab. 2). On the other hand, as expressed in the metaphor "languages are like cherries"[8], knowing one language and participating in the project enhances the interest for other languages and broaden one's knowledge and horizons, according to the words of sSci-3b, sSci-7 and sEcn-9 (Tab. 2).

In summary, as grasped in the current students' perspectives in section 3.2, the voices of former students reaffirm the instrumental nature of English and of other languages and interweave it with the cultural and affective one. They seem to perceive that English facilitates the learning and use of other languages (while travelling, at work, etc.); it allows them to become interested and acquainted with people from other cultures (not only those of the UK or US). Intercultural competence and some of its skills, hence, emerge (Ramos, 2013). The contribution of English and the EP project to "empowering" the self-concept of these students to learn other languages and in broadening their knowledge is evident, which is clearly related to the affective dimension of plurilingual competence (cf. study of Andrade *et al.*, 1993). Within this dimension it is understood that the relationship one establishes with other languages is determined by the perception one has of those languages and of their importance in co-relation with others, namely in the construction of one's linguistic and cultural repertoire.

3.4 English's relationship with other languages and cultures (teachers)

The question *Do you think the English language can promote plurilingualism? How?* provokes affirmative answers in both language teachers but with very different levels of certainty. Eng-new does not have any doubt, whereas Eng-old is more hesitant, since she recognises that English has assumed a *hegemonic and dangerous* role in the world. Eng-new's argument is the experience of a student of hers, who participated in the Erasmus mobility project in Poland and used English, *the universal language* (the same expression used above by one former student), with Erasmus students from other countries; through English, she said, they can still exchange impressions and try to learn the colleagues' languages. In a

[8] The analogy was readapted from the Portuguese saying "*as palavras são como as cerejas … atrás de uma vêm outras*" by Sílvia Melo-Pfeiffer (November 2015) who used it as a title for a seminar she gave during the *Segundas Jornadas do LALE* (https://www.ua.pt/cidtff/lale/page/20486).

similar way, Eng-old argues that communication when travelling abroad will necessarily start in English, but it could promote the communication in the language of the country we are visiting or of the person we are talking to.

In both cases, English is perceived as a "bridge language" – Crystal's "global language" (2003) and Seidlhofer's "lingua franca" (2005) – to approach (people speaking) other languages and, though not explicitly said, to know cultures of non-English native countries, as seen in students' answers concerning the importance of FL (current learners) or the relationship with the English language (current and former). Mobility students together in the same foreign country somehow belong to the community of "non-inhabitants"; even before becoming "good new friends", they enjoy sharing differences and commonalities of their cultural behaviours, food and drinks, animals' sounds, etc., and, to do that, they speak a "neutral" language which is usually English, at least until they master the local one. English as a bridge language used in culturally diverse groups becomes not only the language of communication, but also the language of identification (Edwards, 2010; Fiedler, 2011), and "transforms a usual and stable way of communication, expression, and seeing ourselves as we are used to" (Kaire, 2017: 38). On a different level, while visiting a country where we do not know the language(s), the use of a common language such as English can support the understanding of cultural aspects of the country and people, advancing observation and immersion.

From observed and spoken teaching practices – revealed by classroom activities and different moments of teachers' interview, as well as confirmed by older students – conflating English merely with English speaking countries is very frequent and it could explain an innocent statement such as *all scientists are English*, by one young student who is used to hearing this language in Science documentaries or TV shows. This requires more careful teacher work on the role of the English language in Science and on non-language subjects, which can also be a context to understand the mother tongue and other foreign languages (Piacentini *et al.*, 2016: 1990).

The potential for project classes (both EP and PT ones, see section 2.2) other than English lessons to deepen these aspects is high, also in the opinion of one of the two EP Science teacher. She actually describes – in another interview – the presence of English in this CLIL-type project as an

advantage for learners, since an additional language enables them to perceive Science as "universal" (*we cannot exactly associate Science to one country [it is] an endeavour of humanity […] to understand the world […] by the language being present [the project] likely broadens a bit more this vision of something beyond the nation*). In the experience of the "English Plus" students, English even provides a way to gain a wider perspective in a specific discipline (Piacentini *et al.*, 2018). We can see this project as an opportunity for "internationalization at home", according to Beleen and Jones's definition: "the purposeful integration of international and intercultural dimensions into the formal and informal curriculum for all students within domestic learning environments" (2015: 69). This is valid, as these authors assert, assuming a broad concept of "culture" (integrating local cultural and international perspectives, as also suggested by that teacher) in addition to implementing the programme in English that may not, by itself, "internationalise" the curriculum.

As noted by Eng-old, English, used as a common and international language, "stands out" from other languages and might threaten them (Crystal, 2003; Smokotin *et al.*, 2014), but much relies on teacher awareness and how the English teaching is "taken on board" as a "global lingua franca" rather than "one of the foreign languages" (Smokotin *et al.*, 2014). Language teachers should thus overcome the association of cultural aspects of English just with, for instance, the royal family (England) or Thanksgiving Day (United States); they should direct English education more to the intercultural opportunities and bridges to other languages (without excluding the learners' mother tongue) that English can offer (Pinho and Costa, 2018), as a first contact and neutral variant. Moreover, a deeper use of plurilingual resources – e. g., music and videos, as emerged from younger students and commented above, or the "multilingual chat rooms" described by Melo-Pfeifer (2014) to fulfil the older student's linguistic interest and desire – is advocated.

These aspects are actually feasible, because we have observed EP teachers already making use of non-conventional strategies in CLIL classroom practices (hands-on, debates, song- or game-based, using online resources, etc.) that might be, indeed, the reason for a greater learner engagement in CLIL settings than in non-CLIL ones, as related by the teachers themselves. From another viewpoint, as defended by Sudhoff, CLIL learning material can offer an intercultural approach "by extracting similarities, differences and the author's perspective" and authentic task- or project-based work typical of student-centred teaching methodologies

"can provide ample opportunities for intercultural learning in CLIL contexts" (2010: 36), and "to internationalise teaching and learning" (Beleen and Jones, 2015: 64), already in compulsory instruction.

4. Conclusions

According to the analysed data, the presence of English is notable in students' lives, both at school – as the first curricular FL and within the CLIL "English Plus" project – and outside the school walls, in their daily activities or trips and encounters. Even so, some misconceptions and misinterpretations regarding the nature or the use of English and about the world of Languages and of Sciences still need to be worked on more thoroughly, through teacher planning and practices, both in CLIL and non-CLIL classes, entailing a broader (inter)cultural perspective. The idea of the English language and of its varieties appears to not be fully acknowledged, since English teaching practices tend to focus mainly in the British and American "Englishes", as well as on the cultural aspects of the two countries related to them. This might lead to a gap in students' knowledge of the diversity within the English language; learners actually often link it to either the United Kingdom or the United States or relate the global yet culturally empty idea of English as a lingua franca.

However, students disclose the role of English as a bridge to get to know other cultures and learn other languages, because of personal experiences but also through the experience of activities and resources within the CLIL-type project. Our study reveals indeed that current students ("low CLIL-exposed") possess a plurilingual repertoire beyond the school and some expectations of intercultural encounters and former students ("high CLIL-exposed") express curiosity about and an actual dedication to other foreign languages and people from other countries. It is possible, then, to think that CLIL classes (material, tasks, etc.) may develop students' plurilingual competence, namely by motivating them to contact with diverse languages and providing a wider awareness of Otherness. This is a favourable environment for assuming an intercultural approach.

In this respect, it is worth recalling the setting of this CLIL-type programme: 45 minutes of Science with English, 45 of Science mainly in Portuguese and 45 of PT (English on socio-cultural subject-related topics), besides the traditional English classes. These conditions are a potential context for English to be integrated into and expanded by content topics and curricular (global and local) cultures. They also allow for Science to

be perceived as also being established outside of Portugal, as highlighted by one subject teacher, and outside of England, a concept to be confronted with students. The construction with students of knowledge and understanding based on transdisciplinary, hence, intercultural principles is essential, and could enable the boundaries of Content and Language classes to be permeated. It is also through the programme and its strategies and encounters that students may have developed some self-confidence in English learning, in line with previous studies on social gains through CLIL. One's stronger self-concept in English, in turn, supports the learning of other languages, which is one first key to accessing other cultures.

By attempting to give an answer to our research question, therefore, one may consider that intercultural learning in a CLIL implementation is a natural connotation rather than an additional demand, provided that teachers and learners act as "architects" of a project constantly shaping this already present "raw material". In addition, CLIL represents a "fair" opportunity for learners to have a greater exposure to English at home apart from private language schools, and compels teachers to work in a collaborative and cross-curricular way, learning through each other's styles and subjects.

Limitations of our study are connected with being at an exploratory stage, thus evidence from the participants' voice need to be triangulated with a finer exploration of plurilingual and intercultural contexts actually present in classroom practices and learning material. Also, further research is required on how the cultures of English may be cultivated through Science and how the nature of Science may be understood through English. The role of a foreign language in the awareness of the mother tongue and one's culture also deserves more attention. We conclude by stating that CLIL may consist of a privileged context for an intercultural approach, namely due to its student-centred, authentic and integrative nature aimed at learners' development. Nevertheless, further endeavour is necessary, to include a wider range of diversity in CLIL provision that would allow for the promotion of plurilingual and intercultural experiences for students and the whole educational community.

Funding

This work is financed by national funds through the FCT – *Fundação para a Ciência e a Tecnologia*, I.P., under the PhD grant SFRH/BD/102895/2014.

Acknowledgement

A special THANKS to my partner Gareth and to his "understanding immersion" in the world of education and its lexicon regardless of the language.

References

Aktor, R. and Risager, K. (2001). Cultural understanding in Danish schools. In Byram, Nichols & Stevens (eds.). *Developing intercultural competence in practice*, 219–235. Clevedon: Multilingual Matters.

Andrade, A. I., Araújo e Sá, M. H., Bartolomeu, I., Martins, F., Melo, S., Santos, L. and Simões, A. R. (2003). Análise e construção da competência plurilinue – alguns percursos didácticos [Analysis and construction of plurilingual competence – some educational paths]. In Neto *et al.* (orgs.). *Didácticas e metodologias de educação – percursos e desafios. Actas do IV Encontro Nacional de Didácticas e Metodologias da Educação*, 489–506. Évora: Universidade de Évora.

Antequera, J. M. A. (2016). *Assessment of the Intercultural Competence in Primary Education: A comparative view between CLIL and non-CLIL contexts*. Master thesis, Universidad de Córdoba.

Barbero, T. (2006). Insegnare in lingua straniera: quali sfide? Quali difficoltà? [Teaching in a foreign language: what challenges? What difficulties?]. In Coonan (ed.). *CLIL: un nuovo ambiente di apprendimento. Sviluppi e riflessioni sull'uso veicolare di una lingua seconda/straniera,* 105–117. Venezia: Libreria Editrice Cafoscarina.

Beacco, J.-C., Byram, M., Cavalli, M., Coste, D., Cuenat, M. E., Goullier, F. and Panthier, J. (2010). *Guide for the development and implementation of curricula for plurilingual and intercultural education*. Strasbourg: COE. Retrieved from http://www.coe.int/t/dg4/linguistic/Publications_en.asp

Beleen, J. and Jones, E. (2015). Redefining Internationalization at Home. In Curaj, Matei, Pricopie, Salmi and Scott (eds.). *The European Higher*

Education Area. Between Critical Reflections and Future Policies, 59-72. Cham: Springer International Publishing.

Bernaus, M., Furlong, Á., Kervran, K. and Jonckheere, S. (2012). An initiative for the inclusion of plurilingualism/culturalism in CLIL: the european project ConBaT+. TRICLIL proceedings. *Better CLIL: more opportunities in primary, secondary and higher education*, 158–162. Bellaterra: Universitat Autònoma de Barcelona.

Blanchard, B., Masserot, V. and Holbrook, J. (2014). The PROFILES Project Promoting Science Teaching in a Foreign Language. *Science Education International*, 25(2), 78–96. Retrieved from http://www.icaseonline.net/sei/june2014/p4.pdf

Breidbach, S. (2007). *Bildung, Kultur, Wissenschaft. Reflexive Didaktik für den bilingualen Sachfachunterricht*. Münster: Waxmann.

Byram, M. (2008). *From Foreign Language Education to Education for Intercultural Citizenship. Essays and Reflections*. Clevedon: Multilingual Matters.

Campos, A. T. S. (2009). Strategies to Raise Cultural Awareness and Create Multicultural Materials and Activities in the Language Classroom. *Revista de Lenguas Modernas*, (11), 383–390. Retrieved from https://revistas.ucr.ac.cr/index.php/rlm/article/view/9452/8902

Cenoz, J. (2015). Content-based instruction and content and language integrated learning: the same or different? *Language, Culture and Curriculum*, 28(1), 8–24. https://doi.org/10.1080/07908318.2014.1000922

Clegg, J. (2007). Analysing the Language Demands of lessons taught in a second language. *Revista Española de Lingüística Aplicada*, 1, 113–128. Retrieved from https://dialnet.unirioja.es/servlet/articulo?codigo=2575499

Council of Europe. (2001). *Common European Framework of Reference for Languages: Learning, Teaching, Assessment (CEFR)*. Strasbourg: COE. Retrieved from https://rm.coe.int/1680459f97

Coyle, D. (2005). *CLIL Planning tools for Teachers*. University of Nottingham: School of Education.

Coyle, D. (2013). Listening to learners: An investigation into "successful learning" across CLIL contexts. *International Journal of Bilingual Education and Bilingualism*, 16(3), 244–266. https://doi.org/10.1080/13670050.2013.777384

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

Crystal, D. (2003). *English as a global language*. Cambridge: Cambridge University Press. https://doi.org/10.1353/lan.2005.0220

Cummins, J. (1987). Bilingualism, language proficiency and metalinguistic development. In Homel, Palji & Aaronson (eds.). *Childhood Bilingualism: Aspects of Linguistic, Cognitive and Social Development*, 57–73. Hillsdale, N. J.: Erlbaum.

Dallinger, S., Jonkmann, K., Hollm, J. and Fiege, C. (2016).The effect of content and language integrated learning on students' English and history competences – Killing two birds with one stone? *Learning and Instruction*, 41(1), 23-31. https://doi.org/10.1016/j.learninstruc.2015.09.003

Dalton-Puffer, C. (2007). *Discourse in Content and Language Integrated Learning (CLIL) classrooms*. Amsterdam: John Benjamins Publishing.

Dalton-Puffer, C. and Nikula, T. (2006). Pragmatics of content-based instruction: Teacher and student directives in Finnish and Austrian classrooms. *Applied Linguistics*, 27(2), 241–267. https://doi.org/10.1093/applin/aml007

Dörnyei, Z. (1998). Motivation in second and foreign language learning. *Language Teaching*, 31(3), 117–135. https://doi.org/10.1017/S026144480001315X

Edwards, J. (2010). *Minority Languages and Group Identity. Cases and Categories*. Amsterdam: Benjamins.

Escobar Urmeneta, C. and Evnitskaya, N. (2014). 'Do you know Actimel?' The adaptive nature of dialogic teacher-led discussions in the CLIL science classroom: a case study. *The Language Learning Journal*, 42(2), 165–180. https://doi.org/10.1080/09571736.2014.889507

European Commission. (1995). *White Paper on Education and Training. Teaching and Learning*. Brussels: COM. Retrieved from https://publications.europa.eu/en/publication-detail/-/publication/d0a8aa7a-5311-4eee-904c-98fa541108d8/language-en

European Commission. (2003). *Promoting Language Learning and Linguistic Diversity: An Action Plan 2004 – 2006*. Bruxelles: COM. Retrieved from https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2003:0449:FIN:EN:PDF

European Commission. (2006). *Content and Language Integrated Learning (CLIL) at School in Europe*. Brussels: COM. Retrieved from https://publications.europa.eu/en/publication-detail/-/publication/756ebdaa-f694-44e4-8409-21eef02c9b9b

European Commission. (2011). *Civil Society Platform on Multilingualism*. Brussels: COM. Retrieved from http://elen.ngo/wp-content/uploads/2016/05/report-civil-society_en.pdf

European Commission. (2017). *Key Data on Teaching Languages at School in Europe – 2017*. Brussels: COM. https://doi.org/10.2797/12061

Evnitskaya, N. and Morton, T. (2011). Knowledge construction, meaning-making and interaction in CLIL science classroom communities of practice. *Language and Education*, 25(2), 109–127. https://doi.org/10.1080/09500782.2010.547199

Fiedler, S. (2011). English as a lingua franca – a native-culture-free cose? Language of communication vs. language of identification. *Apples – Journal of Applied Language Studies*, 5(3), 79-97. Retrieved from http://apples.jyu.fi/article_files/Fiedler_final.pdf

García, M. C. M. (2013). The intercultural turn brought about by the implementation of CLIL programmes in Spanish monolingual areas: a case study of Andalusian primary and secondary schools. *Language Learning Journal*, 41(3), 268–283. https://doi.org/10.1080/09571736.2013.836345

Gardner, R. C. and MacIntyre, P. D. (1993). A student's contributions to second-language learning. Part II: Affective variables. *Language Teaching*, 26, 1–11. https://doi.org/10.1017/S0261444800000045

Jenkins, J. (2015). Repositioning English and multilingualism in English as a Lingua Franca. *Englishes in Practice*, 2(3), 49–85. https://doi.org/10.1515/eip-2015-0003

Kaire, S. (2017). We are on the same boat, but still I am from another culture: the lived experiences of learning in groups. *Encyclopaideia*, 21(47), 29-48. https://doi.org/10.6092/issn.1825-8670/6946

Koller, O., Leucht, M., and Pant, H. A. (2012). Effekte bilingualen Unterrichts auf die Englisch-leitstungen in der Sekundarsufe /Effects of Bilingual Instruction on English Achievement in Lower Secondary Schools. *Unterrichtswissenschaft*, 40(4), 334-350. Retrieved from http://pure.ipn.uni-kiel.de/portal/en/publications/effekte-bilingualen-unterrichts-auf-die-englischleistungen-in-der-sekundarstufe-i(285a9716-886a-4089-b3ae-a253e2d86284).html

Koro, R. (2017). *To what extent is a CLIL approach useful in teaching intercultural understanding in MFL?* Doctoral thesis, University of Reading.

Langé, G. (2002). *TIECLIL Professional Development Course.* Retrieved from http://www.tieclil.org/index.htm

Lasagabaster, D. (2008). Foreign Language Competence in Content and Language Integrated Courses. *The Open Applied Linguistics Journal*, 1, 30–41. https://doi.org/10.2174/1874913500801010030

Lasagabaster, D. and Sierra, J. M. (2010). Immersion and CLIL in

English: more differences than similarities. *ELT Journal*, 64(4), 367–375. https://doi.org/10.1093/elt/ccp082

Lodico, M. G., Spaulding, D. T. and Voegtle, K. H. (2006). *Methods in Educational Research. From theory to practice*. *Jossey-Bass A Wiley Imprint*. San Francisco, CA: John Wiley & Sons, Inc.

Lourenço, M. and Mourão, S. (2017). Learning English (and other languages) in Portugal. *Language Issues*, 28(2), 53–55. Retrieved from www.researchgate.net/profile/Monica_Lourenco/publication/322722503_Learning_English_and_other_languages_in_Portugal/links/5a6b5088458515b2d055a50f/Learning-English-and-other-languages-in-Portugal.pdf

Marsh, D. (2002). *CLIL/EMILE - The European Dimension. Actions, Trends and Foresight Potential*. Jyväskylä: Continuing Education centre.

Marsh, D. (2012). *Content and Language Integrated Learning (CLIL) A Development Trajectory*. Cordoba: Servicio de Publicaciones de la Universidad de Córdoba.

Marsh, D. and Langé, G. (eds.) (2000). *Using Languages to Learn and Learning to Use Languages*. *Using Languages to Learn and Learning to Use Languages*. Jyväskylä: University of Jyväskylä.

Marsh, D., Mehisto, P., Wolff, D. and Frigols Martín, M. J. (2011). *European Framework for CLIL Teacher Education*. Graz: ECML.

Mehisto, P. (2012). Criteria for producing CLIL learning material. *Encuentro*, *21*, 15–33. Retrieved from http://files.eric.ed.gov/fulltext/ED539729.pdf

Melo-Pfeifer, S. (2014). Intercomprehension between Romance Languages and the role of English: a study of multilingual chat rooms. *International Journal of Multilingualism*, 11, 120–137. https://doi.org/10.1080/14790718.2012.679276

Milton, J. and Meara, P. (1998). Are the British really bad at learning foreign languages? *Language Learning Journal*, 18(1), 68–76. https://doi.org/10.1080/09571739885200291

Mons, M., Simões, A. R. and Andrade, A. I. (2018). La construcción de la identidad: las historias de vida linguísticas [Identity construction: linguistic life stories]. In Helmchen and Melo-Pfeifer (orgs.). *Plurilingual Literary Practices at school and in teacher education*, 63-78. Berlin: Peter Lang.

Pavón Vázquez, V. and Ellison, M. (2013). Examining teacher roles and competences in Content and Language Integrated Learning (CLIL). *Lingvarvm Arena*, 4, 65–78. Retrieved from http://ler.letras.up.pt/uploads/ficheiros/12007.pdf

Pérez Cañado, M. L. (2016). Are teachers ready for CLIL? Evidence from a European study. *European Journal of Teacher Education*, 39(2), 202–221. https://doi.org/10.1080/02619768.2016.1138104

Pérez, E., Gómez, M. H. and Serrano, R. (2017). CLIL Teachers' Perceptions of Intercultural Competence in Primary Education. *Revista Digital de Investigación En Docencia Universitaria*, 11(1), 82–99. https://doi.org/10.19083/ridu.11.497

Piacentini, V., Simões, A. R. and Vieira, R. M. (2016). Abordagem holística no sistema educativo Português para desenvolver a(s) Literacia(s) das Ciências integradas com o Inglês / Holistic approach in the Portuguese education system to develop Literacies of Science integrated with English.. *Indagatio Didactica*, 8(1), 1975–1192. Retrieved from http://revistas.ua.pt/index.php/ID/article/view/3981/3663

Piacentini, V., Simões, A. R. and Vieira, R. M. (2017). The language focus of Science education integrated with English learning. *Enseñanza de Las Ciencias*, Extra(2017), 399–404. Retrieved from http://ddd.uab.cat/record/184622

Piacentini, V., Simões, A. R. and Vieira, R. M. (2018). What students tell teachers about practices that integrate subjects with English in a lower secondary school in Portugal. *eTEALS*, 9(s1), 57-76. https://doi.org/10.2478/eteals-2018-0013

Pinho, A. S. and Costa, A. M. (2018). Educação intercultural e ensino de inglês no 3º Ciclo do Ensino Básico [Intercultural education and English teaching in the 3rd Cycle of Primary School]. In Veiga (coord.). *O ensino na escola de hoje - teoria, investigação e aplicação*, 383-413. Lisboa: Climepsi Editores.

Ramos, N. (2013). Interculturalidade(s) e mobilidade(s) no espaço europeu: viver e comunicar entre culturas [Inculturality(ies) and mobility(ies) in the European space: living and communicating among cultures]. In Pina, Ferreira and Martins (orgs.). *The overarching issues of the European space*, 343-360. Porto: Editora da Faculdade de Letras da Universidade do Porto.

Seidlhofer, B. (2005). English as a lingua franca. *ELT Journal*, 59(4), 339–341. https://doi.org/10.1093/elt/cci064

Simões, R. A., Pinho, S. A., Costa, M. A. and Costa, R. A. (2013). The Project English Plus: a CLIL approach in a Portuguese school. *Indagatio Didatica*, 5(4), 30–51. Retrieved from http://revistas.ua.pt/index.php/ID/article/viewFile/2565/2430

Smokotin, V. M., Alekseyenko, A. S. and Petrova, G. I. (2014). The Phenomenon of Linguistic Globalization: English as the Global Lingua

Franca (EGLF). *Procedia - Social and Behavioral Sciences*, 154, 509–513. https://doi.org/10.1016/j.sbspro.2014.10.177

Sudhoff, J. (2010). CLIL and Intercultural Communicative Competence: Foundations and Approaches towards a Fusion. *International CLIL Research Journal*, *1*(3), 30–37. Retrieved from http://www.icrj.eu/13/article3.html

Ting, Y.-L. T. (2010). CLIL Appeals to How the Brain Likes Its Information: Examples From CLIL-(Neuro)Science. *International CLIL Research Journal*, 1(3), 3–18. Retrieved from http://www.icrj.eu/13/article1.html

White, J., Drew, S. and Hay, T. (2009). Ethnography Versus Case Study. Positioning Research and Researchers. *Qualitative Research Journal*, 9(1), 18–27. https://doi.org/10.3316/QRJ0901018

Wildhage, M. and Otten, E. (eds.) (2003). *Praxis des bilingualen Unterricht*. Berlin: Cornelsen.

Wolff, D. (2012). The European framework for CLIL Teacher Education. *Synergies Italie*, 8, 105–116. Retrieved from http://gerflint.fr/Base/Italie8/dieter_wolff.pdf

Yin, R. K. (1994). *Case Study Research. Designs and Methods*. Thousand Oaks - London - New Delhi: SAGE Publications.

sciendo

e-TEALS no. 9 | 2018
Special Edition
An e-journal of Teacher Education and Applied Language Studies

What Students Tell Teachers about Practices that Integrate Subjects with English in a Lower Secondary School in Portugal [1]

Valentina PIACENTINI, Ana Raquel SIMÕES and Rui Marques VIEIRA
|University of Aveiro (CIDTFF)

Abstract | CLIL (Content and Language Integrated Learning) is an approach thought to provide, mainly during Content (non-language, subject) classes, a meaningful environment at school for the use and learning of a foreign language (FL), and may also improve conditions and practices of the specific subject. Moreover, CLIL can represent a research context to gauge the importance of language-aware teaching as is the case with the Portuguese "English Plus" project (EP), in which History and Science are taught/ learnt with/in English at lower secondary school. Our doctoral research is designed as a descriptive-explanatory case study on the EP project and its participants (English and Science teachers, former and current students). More specifically, this work focuses on students and shows their relationship with the EP approach and (dis)advantages in learning a subject with a FL. Data were collected through a semi-structured questionnaire and interview, with subsequent content analysis. The importance of "integrated learning" and of diverse strategies used by the teacher to support/scaffold learning is present in students' perspectives which may further influence teaching practices.

Key words | CLIL (Content and Language Integrated Learning), English as a foreign language, subjects (History and Science), language-aware teaching, students' perspectives

Citation: Valentina Piacentini, Ana Raquel Simões and Rui Marques Vieira, "What Students Tell Teachers about Practices that Integrate Subjects with English in a Lower Secondary School in Portugal." *e-TEALS: An e-journal of Teacher Education and Applied Language Studies* 9 Special Edition (2018): 57-76 ISSN 1647-712X

10.2478/eteals-2018-0013

1. Introduction

When considering the importance of scientific literacy (Roberts and Bybee; Vieira, Tenreiro--Vieira and Martins) and language proficiency (Common European Framework of Reference for Languages, CEFR, Council of Europe) for education and its global demands, research on the "combination" of Science education and English language learning as well as on the language focus of Science education (Lin; Bunch, Shaw and Geaney; Wellington and Osborne) is highly relevant. For many students the greatest difficulty in studying Science is to learn the language of Science, therefore a language-focused Science education is justified (Wellington and Osborne). Owing to the presence of a foreign language (FL), Content and Language Integrated Learning (see section 2 below) represents a possible educational approach for scholars to gauge the importance for (Science) teachers of becoming language-aware (Blanchard, Masserot and Holbrook; Coyle, Hood and Marsh; Wolff).

As claimed by Scott, Mortimer and Aguiar, researchers should work on understanding how the construction of scientific knowledge develops through language and other modes of communication. Research is also required on CLIL Science learning contexts, in which an additional language has to be learnt besides the mother tongue. Furthermore, a greater collaboration between applied linguists and researchers in subject-specific education is sought in studies on CLIL practice (Nikula, Dalton-Puffer and Llinares). For more than ten years, works mapping European CLIL initiatives at compulsory school levels contained no reference to Portugal [European Commission, "Content and Language Integrated Learning (CLIL) at School in Europe"], but recently more and more projects have appeared (European Commission, "Key Data on Teaching Languages at School in Europe – 2017"). Nevertheless, corresponding research is still represented by individual examples and many studies are focused on the tertiary level.

The relevance of carrying out research on school programmes, such as the Portuguese CLIL--type "English Plus" project (first in History then Science) presented here, is clear. More specifically, the objective of this work (part of a broader PhD study) is the characterization of students' perspectives through exploring their relationship with the "integration project" and its approach, as well as benefits

and difficulties they identify in learning a specific discipline with/in a FL. Their point of view may contribute, in turn, to a reflection on and orientation of educational practices.

2. The CLIL Educational Approach

Considered as one strategy to promote plurilingual and intercultural education (Beacco *et al.*) and one possible initiative for foreign language education in Europe (European Commission, "Civil Society Platform on Multilingualism"), CLIL is described as "any dual-focused educational context in which an additional language, thus not usually the first language of the learners involved, is used as a medium in the teaching and learning of non-language content" (Marsh, "CLIL/EMILE – The European Dimension" 2). It stems from immersion programmes of bilingual countries such as Canada, but differences have been noted in CLIL initiatives: for instance, the "non-nativeness" of teachers and students, and readapted/scaffolded teaching materials (Lasagabaster and Sierra).

According to Krashen's theory on Second Language Acquisition, languages are learnt while they are used, and CLIL classes are authentic learning environments to achieve communicative competence through daily classroom activities (Dalton-Puffer and Nikula). As opposed to what happens in traditional language classes where form and structure of a FL are the main learning object, in CLIL language and content (of a specific subject) converge in a "dual focus" for learning and teaching (Coyle, Hood and Marsh; Marsh *et al.*; Pavón Vázquez and Ellison). CLIL is flexible. There is no formula for organising a CLIL programme; it is the context that determines this (Coyle, "CLIL Planning Tools for Teachers"). However, the 4Cs framework (Coyle, Hood and Marsh 53-56) is useful for planning CLIL lessons where students learn subject topics (**C**ontent: new knowledge, skills and understanding) and related **C**ultural and societal issues, through activities which provide **C**ognitive challenge; at the same time, they **C**ommunicate and learn how to use the languages OF, FOR and THROUGH learning (the so called "language triptych", cf. Coyle).

In making the language use authentic for the specific need to understand content and to construct meaning (Coyle, Hood and Marsh), CLIL promotes interaction between learners who

thus become central in the learning process (Ting). As Mehisto clarifies, quality CLIL implementation is based on intention and process visibility, and may foster learner autonomy and cooperative learning, self and peer formative assessment (17-25); it requires the development of a "language-supportive pedagogy" (Clegg) also through a diversity of teacher scaffolding strategies. Actually, challenges encountered using an additional language increase teacher awareness of learner linguistic needs (Blanchard, Masserot and Holbrook; Marsh, "Content and Language Integrated Learning. A Development Trajectory") and a possibly better treatment of content (Escobar Urmeneta and Evnitskaya). Major difficulties in the implementation of CLIL classes are caused not by using a FL, but by the lack of appropriate methodology used in class (Barbero). Students not having sufficient time to apply what they have learned is indicated as the main constraint (Beacco et al.; Coyle, Hood and Marsh; Marsh and Langé; Milton and Meara); other obstacles typical of such programmes are curriculum and policy constraints, as well as limited material.

In defiance of these aspects, CLIL is acknowledged as a "change agent": it provides experiences in more than one language within monolingual learning environments (Coyle, "An Investigation into 'Successful Learning' across CLIL Contexts") and entails teaching strategies that prepare any teacher to work in CLIL-like contexts in European schools[2] (Wolff). Therefore, reflecting on "beliefs, values and practice" is fundamental (Pavón Vázquez and Ellison 77), "to equip CLIL teachers to bear the challenge of that change" (Pérez Cañado 217). One possible way is to understand the student perception of CLIL projects and of learning through CLIL. A variety of approaches to exploring student perspectives about and attitudes toward such programmes exists (Tedick and Cammarata). The present study aims to continue and extend previous studies on CLIL learners' points of view in Portugal (Simões et al.) as well as to integrate voices from students of different ages.

3. Context, Participants and Methods

In Portugal, alongside the top-down *Programa Escolas Bilingues em Inglês* / Bilingual Schools Programme (organised by the Ministry of Education and the British Council and currently involving 25 state school clusters[3]), different bottom-up CLIL initiatives developed by teachers exist. We describe here the CLIL-type "English Plus" (EP) project, implemented in one lower secondary state school (from the 7th to the 9th grades) in North Portugal (District of Aveiro). The EP project integrates the use/learning of English with History (from 2010 to 2013, Simões et al.) and Science (since 2014 onwards, Piacentini, Simões and Vieira, "Holistic Approach in the Portuguese Education System to Develop Literacies of Science Integrated with English" and "The Language Focus of Science Education Integrated with English Learning").

Considering the specificity of the project, a descriptive-explanatory case study was designed in 2015-2016 within our doctoral research. It is an in-depth study, having teachers and students "constructing the reality" of EP at different times and levels. In the present work we focus on students, with the following profiles, A and B:

A. Lower secondary school students provided with EP in Science in the year of the study (current students); N = 96: 44 7th graders in their first year of the project and 52 8th graders in their second year;

B. High school students in the year of the study who previously (2010-2013) had EP in History (former students); N = 11: 1 in Humanities (sHum-10), 4 in Economics (sEcn-4,5,8,9) and 6 in Science (sSci-1,2,3,6,7,11).

EP students attended on a weekly basis: 45 minutes of History or Science with English (co-teaching: both the subject teacher and the English one are present and using English); 45 minutes of same subject (single-teaching: classes are given by the non-language teacher alone, who can choose to use Portuguese or English); 45 minutes of English on socio-cultural subject-

-related topics (project time: only the English teacher is present). The "English Plus" project means the engagement of all participants (including parents), in and out of school: it requires of teachers more complex planning and implementation of classes; for students, it is demanding and requires more responsibility and autonomy. Students are usually involved in extra-curricular activities related to the project: school trips and their organization; cinema sessions and theatre performances; open day, and so on.

During the broader PhD-related empirical study, data from students were collected, in the Portuguese language, through the following techniques[4] for the cohorts as defined above:

A. because of the large number of current students, an online semi-structured questionnaire was administered; questions about the importance given to the EP project in Science (Q18.1) and advantages/disadvantages connected with the project (Q20/Q21) were selected for the purpose of this paper;[5]

B. considering the maturity and small number of former students, a semi-structured interview was conducted; questions about the opinion on the EP project in History (Q1) and differences between single-teaching and co-teaching in non-language classes (Q4) were selected for this paper.[6]

Qualitative content analysis was performed on open-ended (questionnaire) and transcribed (interview) answers, resulting in inductive coding (peer-checked). We first present results emerging from data collected from former students, then those from current students.

4. Findings: Presentation[7] and Interpretation

4.1. *Learning through EP-History for Former Students*

Perspectives on Disciplines Involved and the Approach

Students were prompted as follows: *I would like you to express your opinion about the "English Plus" project in History…* (Q1). As evident in Figure 1, their answers indicate an accomplishment in: Language (English); learning experience (different activities and membership); composite learning (when both English and History are mentioned as combined); Content (History). Answers are given in descending order: 11 students indicate "Language"; 7, "learning experience"; 6, "composite learning"; 5, "Content".

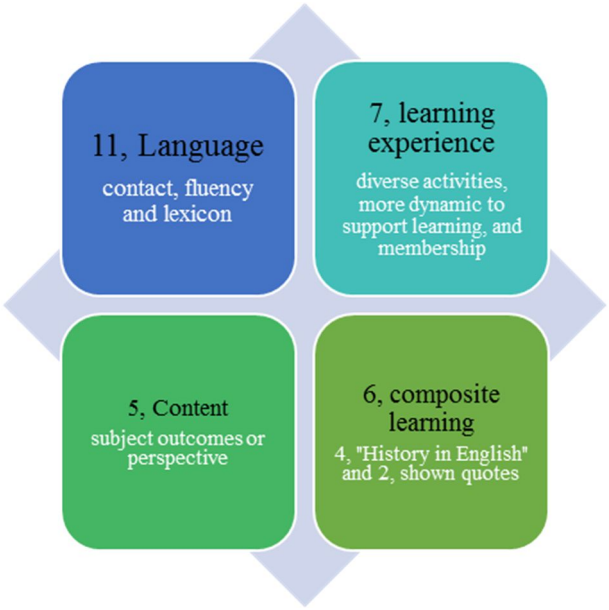


Figure 1: Student Opinion on the EP-History Project (numbers represent occurrences).

Language improvement is unquestioned for students: most of them feel they are more fluent and they possess an enhanced lexicon in English, due to increased contact with the language through the programme. Improvement linked to History is mainly associated to better marks. A deep idea of what Integrated Learning may mean is present in: fs Sci_7, […] *project*

enables students to focus not just on English but also on History […] *using the language like that* […] *not only the learning of terms* […] *we start internalising the language and using it more easily* […] *giving to the [specific] subject a more original shape* […]*;* and sHum-10*,* […] *it helped a lot with the language we did not learn just English in the subject of English* […] *which is basically numbers verbs* […] *we learn about a different History* […] *we don't really have this variety in the subject of History* […].

That is, the learning of both becomes authentic, English is learnt naturally and History is somehow expanded, beyond just "learning History in English" (as pointed by two other students). Furthermore, a greater diversity of activities for the learning of subject content (other *methods* and *learnings*, *different and diverse*, some students said) has been reported, which were more dynamic and became increasingly more cognitively demanding. A great sense of students' responsibility and membership is revealed in sSci-2's words: *because we had History in English* […] *in this school* […] *we were pioneers* […] *it also gave us responsibility* […] *even outside the project there was this [intense] relationship with our teachers* […] *in every activity* […] *during that [project] time* […] *we were all working for the same [goal]*.

Perspectives on the Teaching Experienced in Content Classes

Students were asked *Do you think there was any difference between classes taught by the History and English teachers together* (co-teaching; see section 3) *and classes taught only by the History teacher* (single-teaching; see section 3)*?* (Q4). We encouraged them to talk about the roles of teachers during the co-taught History EP classes or to describe classes led by only the History teacher, rather than to relate a possible difference in the English proficiency of the two teachers. Answers are summarised in Figure 2.

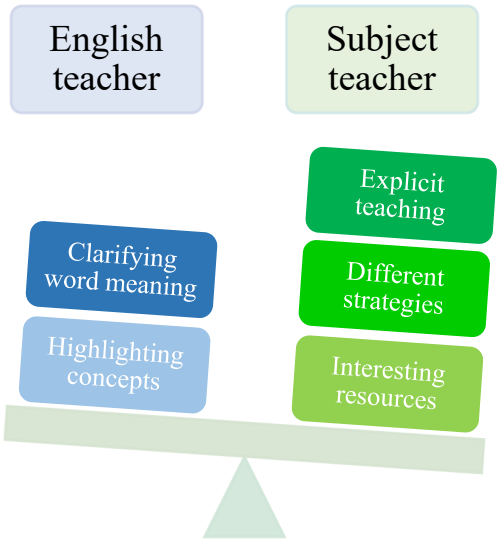


Figure 2: Roles of Teachers in Subject Classes, based on the former EP students' experience; the leaning scale serves to highlight the pivotal practices of the specific discipline teacher, as explained in the text.

With regard to features of the project lessons, as well as the role of teachers involved in them, their voices indicate that interesting and interactive classes have been co-planned and performed, capturing the students' attention and making them focused on learning, and effectively supported by explicit input. Some students state that they have learned better and enjoyed the History classes in English more than the ones in Portuguese: sEcn-5, *[during classes in English we used] Internet and the smart board and in Portuguese it was with textbook and worksheets to fill in by hand* […] *because they are conventional classes*; sEcn-8, *[History classes in English and all their activities] helped me to learn* […] *sometimes I enjoyed studying History in English even more than* […] *in Portuguese because* […] *it worked better and I managed to recall and learn it better* […].

Talking more specifically about the History teacher, students report her open-mindedness in learning/developing new teaching strategies and clear verbal input. This has played a pivotal role (emphasised by the scale of Figure 2 leaning to the right), even during single-taught classes and despite not being proficient in English. Actually, she also went through a learning process ([…] *teacher had to do some research to give classes to us* […] *stories on Internet* […] *words she didn't know and new sheets she had never seen before* […], sEcn-5) and had some difficulty with

the language herself ([…] *she was* […] *more expressive in speaking English* […] *in spite of having some difficulties with the* language […] *she ended up saying things maybe with a simpler vocabulary but we understood better* […], sHum-10).

Hence, the Content teaching, whether through co-teaching or individual teaching, has resulted in the development of alternative resources (compared with the conventional classes, according to sEcn-5) and effective strategies (as evidenced by the positive effects on learning mentioned by sEcn-8, for instance). Moreover, a more explicit teaching through language support and greater interaction has been provided, in order to overcome the learner's difficulties ([…] *in English we had more support* […] *to understand better* […]*than in Portuguese because we understood normally and naturally*, sSci-7), difficulties also experienced by the teacher (as commented by sHum-10).

4.2. *Learning through EP-Science for Current Students*

The Project, its Importance, Benefits and Constraints

Students answered Q18.1 (*Justify why you consider the "English Plus" project in Science (not) important*) and Q20/21 (*In your opinion, what are the advantage(s) / disadvantage(s) of this Project?*). Categories resulting from coding student answers about importance (Q18.1) and advantages (Q20) are the same (Figure 3[8]): A) composite learning ("learning aspects" associated to both Science and English are mentioned); B) language sphere (enhancement in the English language or relevance of it); C) future implications (references to future possibilities of study or job); D) general learning (improved and/or broadened knowledge).

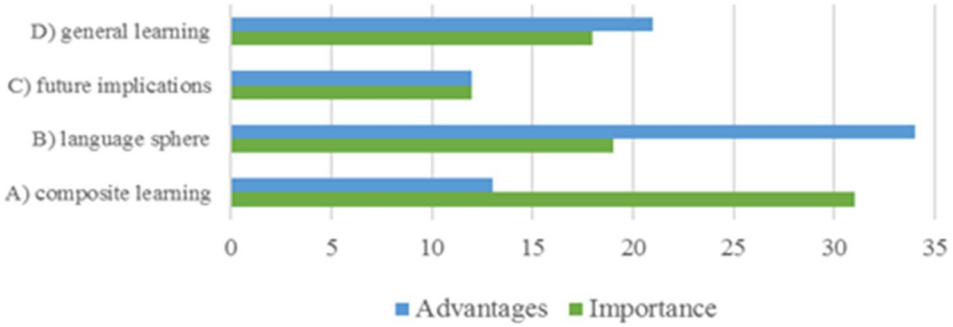


Figure 3: The EP-Science Project and its importance (Q18.1) and advantages (Q20); values on the horizontal axis indicate number of students.

The main advantage for students attending the Science EP project, especially for ones who have already had one year's experience with it (data not shown), is achievements in the language sphere, B); one may consider that language proficiency and vocabulary increase are not difficult processes/abilities to self-assess. It is followed by the advantage offered by developing one's own broader knowledge, D), not specifically referred to as scientific knowledge. A similar level of importance, then, is attributed to the learning of the language, B), and learning in general, D). The field related to future studies and job, C), is definitively more important for 8th than for 7th graders (data not shown), probably because of a tendency to be thinking concretely about their future. The "composite learning" category constitutes the most reported reason for the importance of the project and will be discussed in the following section.

As for difficulties (Q21), students seldom refer to language understanding as an obstacle, even though the older students are more aware of it (data not shown). In fact, they do not seem to identify many disadvantages in the project (more than half of students do not answer), with the exception of the extra dedication required (around 13%). A small percentage of students (around 7%) are also concerned about negative effects on the assessment.

The Combined Learning of Science and English

In the specific case of "composite learning" – the A) field emerging from student answers to both Q18.1 (importance) and Q20 (advantages) in Figure 3 – absolute occurrences of sub-codes (a. learning Science in English; b. scientific English mastery; c. greater learning of both; d. learning Science together with English; e. increased vocabulary of both; f. improvement of Science learning and English vocabulary; g. improvement of Science vocabulary and English proficiency) are plotted in a column chart (Figure 4) to represent aspects of learning associated to both the foreign language and the specific subject, in students' perceptions. To clarify further, the statements coded as c. report the learning of Science and of English as improved (*it helps us to reinforce knowledge both in English and Science*, for instance), whereas those coded as d. Science and English learnt as one (*like that we reconcile two disciplines and turn them into just one*, for instance).

Unlike the previous figures, data are visualised separately for the two grades of students, as there are noticeable differences.

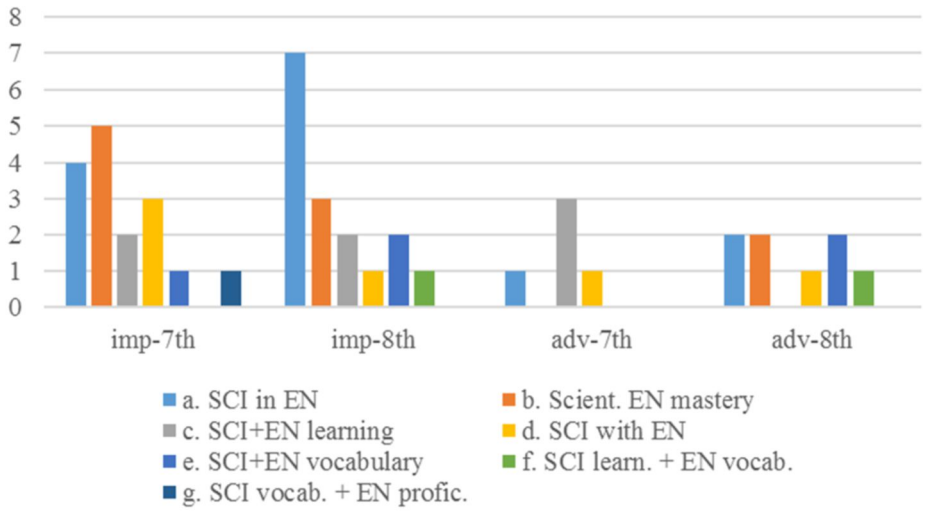


Figure 4: Learning aspects including both Science and English; abbreviations in the key summarise the full description of sub--codes with corresponding letters in the text; values on the vertical axis indicate number of students.

The distribution of importance basically covers all achievements/competences, but the younger students attribute a similar level to the acquisition of scientific terms in English and to the learning of Science in English, whereas for the older ones the EP project is important mainly because they are learning Science in English. Students who still do not know the project effects (7^{th} *vs* 8^{th}) can easily imagine its contribution to an increased knowledge in the subject and in the language but could not perceive any advantage for vocabulary.

With a view to extracting conceptualizations of Integrated Learning from students' perspectives, the results shown in Figure 4 (sub-codes of "composite learning", Importance and Advantages for 7^{th} and 8^{th} graders) have been merged and drawn in Figure 5.

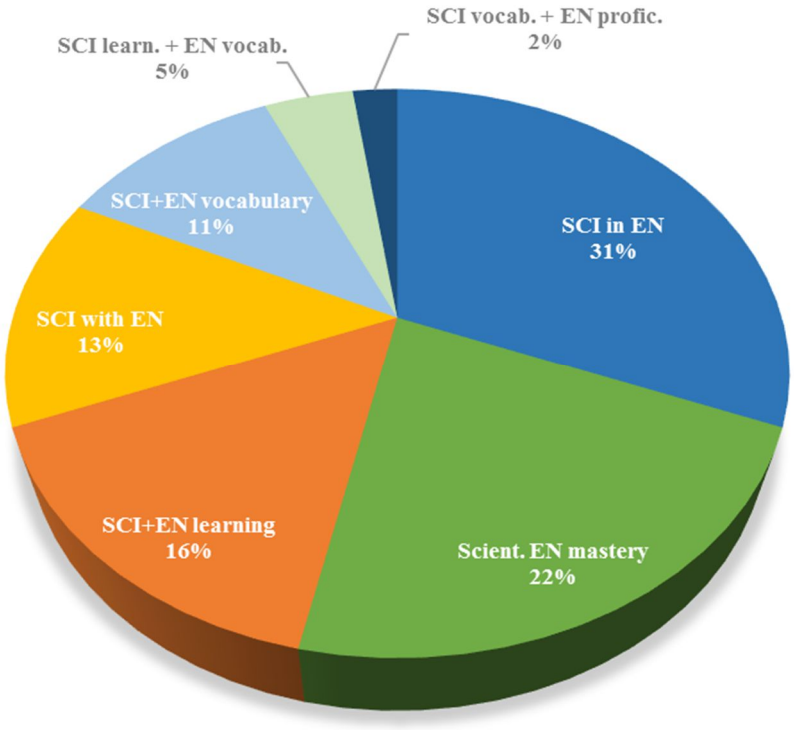


Figure 5: A) Composite learning, possible associations and relative percentages.

The exploration of possible associations reveals that students acknowledge that the CLIL--type EP provision implies the learning of both Content (Science) and Language (English), this category being the most represented one, at least in terms of importance (see A) in Figure 3). However, more than half of the answers convey the learning of Science in English and the acquisition of scientific terms in English. So, the idea that being taught through CLIL could entail learning one discipline just speaking another language is – notable.

5. Considerations

According to students' perspectives, it becomes clear how engaging them as members of the project and providing a different learning experience – activities and methods offered by the CLIL--type "English Plus" project – develop quality teaching that motivates and supports learners. Content (History, for former students, and Science, for current ones) is rarely indicated as improved through project attendance, at least in itself. On the other hand, improvement in English

is a given for EP former and current learners. Here we are reminded that CLIL was developed in Europe as a strategy for language promotion (Marsh, "CLIL/EMILE – The European Dimension").

It is worth considering former students' point of view regarding the Integrated Learning implied/implicit in the approach: the foreign or additional language is learnt in more authentic settings and the subject-specific education is improved. This is in line with the study of Grandinetti, Langellotti, and Ting on CLIL and Science education, and the idea that "CLIL is one pedagogical way"[9] to improve practices (one vision "materialised" in the 2018 Working CLIL Colloquium in Porto). Moreover, the voices of current students contribute to the understanding of conceptions on the integration of Content and Language through a diversity of combinations: "Science merely translated into English", increasing Science lexicon and English vocabulary but also "learning Science interwoven with English", which draws attention to CLIL as a range of educational practices and settings aiming at the learning of both Language and Content, in agreement with Coyle, Hood and Marsh.

The exposure to a different and effective teaching method (explicit, interactive, not conventional, etc.) is a crucial positive outcome of our study. Quality teacher practices are often detected in CLIL environments (Marsh, "Content and Language Integrated Learning. A Development Trajectory") as a consequence of the challenge of working in an additional language. This may make the (subject) teacher adopt a more language-aware attitude in general (Coyle, Hood and Marsh; Wolff), clarifying meanings and ensuring students understand, and developing a more relaxed relationship with them (Blanchard, Masserot and Holbrook 81). In other words, a teacher may become open to the students' (language) learning difficulties and to adapting and changing strategies and resources in order to support/scaffold the "new" learning conditions. As Canet Pladevall and Evnitskaya state, it is a "constant process of rethinking the way one teaches" (176), Science and other content topics. The importance for teachers of assuming and developing a language focus in Science education has been noted in previous studies within CLIL (Piacentini, Simões and Vieira, "The Language Focus of Science Education Integrated with English Learning").

Although significant difficulties connected with this CLIL-type approach are not apparent here, students with some experience with the EP programme have provided, in other contexts within this project, suggestions to their teachers for improving (subject and language) lessons, mostly in terms of content scaffolding and representation (Piacentini, Simões and Vieira, "Holistic Approach in the Portuguese Education System to Develop Literacies of Science Integrated with English"). Further research is necessary to develop a characterization of the EP teachers, who learn throughout the project implementation and from student feedback. The perspective of students with different levels of experience and of learning through CLIL, as portrayed in this work, is indeed a fundamental issue for teachers to understand what strategies are meaningful and effective in general and to orientate teaching in the specific settings of CLIL practice.

Notes

[1] This work is financed by national funds through the FCT – *Fundação para a Ciência e a Tecnologia*, I.P., under the PhD grant SFRH/BD/102895/2014 and within project UID/ CED/00194/2013.

[2] Because of the increasing migratory phenomena, several European countries witness classes where conversational and academic competence levels in the schooling language [BICS (Basic Interpersonal Communication Skills) and CALP (Cognitive Academic Language Proficiency), cf. Cummins, 1987] among learners are heterogeneous.

[3] For further information see www.dge.mec.pt/programa-escolas-bilinguesbilingual-schools-programme.

[4] Complete data are in the process of being analysed and will be presented in future works.

[5] For the complete version of the questionnaire see http://goo.gl/forms/ls5tXdzQNc.

[6] The whole interview guide is comprised of the following questions: **1.** *Gostaria que expressasses a tua opinião sobre o projeto "English Plus" de História [organização, constrangimentos, desafios, vantagens].* **2.** *Tiveste dificuldades durante o projeto? Se sim, quais? Como conseguiste superá-las?* **3.** *Qual a disciplina que mais beneficiou (em termos de estruturação e compreensão, possibilidades de comunicação, integração com a realidade) com o projeto? Porquê? E agora que estás no secundário?* **4.** *Achas que havia diferença entre as aulas em que a professora de História e a professora de Inglês estavam juntas e as aulas em que havia só a de História (maneira da professora apresentar e tratar a disciplina de História)?* **5.** *Lembras de alguma situação em que o facto de utilizar o Inglês facilitou a aprendizagem com respeito ao uso do Português?* **6.** *Gostavas de conhecer ou conheces outras línguas? Quais?* **7.** *Achas que o Inglês (o facto de aprender/usar esta língua) despertou-te a vontade de estudar/aprender outras línguas e culturas? De que maneira?* **8.** *Consideras que o projeto trouxe algumas facilidades no estudo das disciplinas científicas? Se sim, como?* **9.** *Quais as sugestões aos alunos do 3.º ciclo que estão agora envolvidos no "English Plus" de Ciências Naturais?*

[7] Questions asked to students and responses are typed in italic and have been translated from Portuguese by the researcher.

[8] Total does not equal 96 (44 7th graders + 52 8th graders), some answers not having been considered (idiosyncratic, unclear, etc.).

[9] Stated by Golubeva in the "Working CLIL into the future – 10 visions" final session of the *Working CLIL Colloquium* (16th and 17th of March 2018, Faculty of Humanities, University of Porto).

Works Cited

Barbero, Teresina. "Insegnare in Lingua Straniera: Quali Sfide? Quali Difficoltà?" *CLIL: Un Nuovo Ambiente Di Apprendimento. Sviluppi e Riflessioni Sull'uso Veicolare Di Una Lingua Seconda/ Straniera*, edited by Carmel Mary Coonan, Libreria Editrice Cafoscarina, 2006, pp. 105-17.

Beacco, Jean-Claude, et al. *Guide for the Development and Implementation of Curricula for Plurilingual and Intercultural Education*. Council of Europe, 2010.

Blanchard, Brigitte, et al. "The PROFILES Project Promoting Science Teaching in a Foreign Language." *Science Education International*, vol. 25, no. 2, 2014, pp. 78-96. www.icaseonline.net/sei/june2014/p4.pdf. Accessed 11 Feb. 2018.

Bunch, George C., et al. "Documenting the Language Demands of Mainstream Content-Area Assessment for English Learners: Participant Structures, Communicative Modes and Genre in Science Performance Assessments." *Language and Education*, vol. 24, no. 3, 2010, pp. 185-214, doi: 10.1080/09500780903518986

Canet Pladevall, Roser, and Natalia Evnitskaya. "Rethink, Rewrite, Remake or Learning to Teach Science Through English." *AICLE – CLIL – EMILE. Educació Plurilingüe: Experiencias, Research & Polítiques*, edited by Cristina Escobar Urmeneta et al., Servei de Publicacions de la Universitat Autònoma de Barcelona, 2011, pp. 167-77.

Clegg, John. "Analysing the Language Demands of Lessons Taught in a Second Language." *Revista española de lingüística aplicada*, vol. 1, 2007, pp. 113-28, dialnet.unirioja.es/servlet/articulo?codigo=2575499. Accessed 11 Feb. 2018.

Council of Europe. *Common European Framework of Reference for Languages: Learning, Teaching, Assessment (CEFR)*. COE, 2011, rm.coe.int/1680459f97. Accessed 11 Feb. 2018.

Coyle, Do. *CLIL Planning Tools for Teachers*. School of Education – University of Nottingham, 2005, www.unifg.it/sites/default/files/allegatiparagrafo/20-01-2014/coyle_clil_planningtool_kit.pdf. Accessed 11 Feb 2018.

---. "Listening to Learners: An Investigation into 'Successful Learning' across CLIL Contexts." *International Journal of Bilingual Education and Bilingualism*, vol. 16, no. 3, 2013, pp. 244-66, doi:10.1080/13670050.2013.777384.

Coyle, Do, Philip Hood, and David Marsh. *CLIL Content and Language Integrated Learning*. Cambridge UP, 2010.

Cummins, Jim. "Bilingualism, Language Proficiency and Metalinguistic Development." *Childhood Bilingualism: Aspects of Linguistic, Cognitive and Social Development*, edited by Peter Homel et al., Erlbaum, 1987, pp. 57-73.

Dalton-Puffer, Christiane, and Tarja Nikula. "Pragmatics of Content-Based Instruction: Teacher and Student Directives in Finnish and Austrian Classrooms." *Applied Linguistics*, vol. 27, no. 2, 2006, pp. 241-67, doi:10.1093/applin/aml007.

Escobar Urmeneta, Cristina, and Natalia Evnitskaya. "Do You Know Actimel? The Adaptive Nature of Dialogic Teacher-Led Discussions in the CLIL Science Classroom: A Case Study." *The Language Learning Journal*, vol. 42, no. 2, 2014, pp. 165-80, doi:10.1080/09571736.2014.889507.

European Commission. *Content and Language Integrated Learning (CLIL) at School in Europe*. Eurydice Reports, 2006, publications.europa.eu/en/publication-detail/-/publication/756ebdaa-f694-44e4-8409-21eef02c9b9b. Accessed 11 Feb. 2018.

---. *Civil Society Platform on Multilingualism*. COM, 2011, elen.ngo/wp-content/uploads/ 2016/ 05/ report-civil-society_en.pdf. Accessed 11 Feb. 2018.

---. *Key Data on Teaching Languages at School in Europe – 2017*. Eurydice Reports, 2017, doi:10.2797/12061.

Grandinetti, Maria, et al. "How CLIL Can Provide a Pragmatic Means to Renovate Science Education – Even in a Sub-Optimally Bilingual Context." *International Journal of Bilingual Education and Bilingualism*, vol. 16, no. 3, 2013, pp. 354-74. doi:10.1080/13670050.2013.777390.

Lasagabaster, David, and Juan Manuel Sierra. "Immersion and CLIL in English: More Differences than Similarities." *ELT Journal*, vol. 64, no. 4, 2010, pp. 367-75, doi:10.1093/elt/ccp082.

Lin, Angel M. Y. *Language Across the Curriculum & CLIL in English as an Additional Language (EAL) Contexts. Theory and Practice*. Springer, 2016.

Marsh, David. *CLIL/EMILE – The European Dimension. Actions, Trends and Foresight Potential*. Continuing Education Centre in Jyväskylä, 2002.

---. *Content and Language Integrated Learning (CLIL) A Development Trajectory*. Servicio de Publicaciones de la Universidad de Córdoba, 2012.

Marsh, David, and Gisella Langé, editors. *Using Languages to Learn and Learning to Use Languages*. University of Jyväskylä, 2000.

Marsh, David, et al. *European Framework for CLIL Teacher Education*. ECML, 2011, www.ecml.at/Portals/1/documents/ECML-resources/CLIL-EN.pdf?ver=2018-03-21-153925-563. Accessed 11 Feb. 2018.

Mehisto, Peeter. "Criteria for Producing CLIL Learning Material." *Encuentro*, vol. 21, 2012, pp. 15-33, files.eric.ed.gov/fulltext/ED539729.pdf. Accessed 11 Feb. 2018.

Milton, James, and Paul Meara. "Are the British Really Bad at Learning Foreign Languages?" *Language Learning Journal*, vol. 18, no. 1, 1998, pp. 68-76, doi:10.1080/09571739885200291.

Nikula, Tarja, et al. "CLIL Classroom Discourse: Research from Europe." *Journal of Immersion and Content-Based Language*, vol. 1, no. 1, 2013, pp. 70-100, doi:10.1075/jicb.1.1.04nik.

Pavón Vázquez, Víctor, and Maria Ellison. "Examining Teacher Roles and Competences in Content and Language Integrated Learning (CLIL)." *Lingvarvm Arena*, vol. 4, 2013, pp. 65-78, ler.letras.up.pt/uploads/ficheiros/12007.pdf. Accessed 11 Feb. 2018.

Pérez Cañado, María Luisa. "Are Teachers Ready for CLIL? Evidence from a European Study." *European Journal of Teacher Education*, vol. 39, no. 2, 2016, pp. 202-21, doi:10.1080/ 02619768. 2016.1138104.

Piacentini, Valentina, et al. "Abordagem Holística no Sistema Educativo Português para Desenvolver a(s) Literacia(s) das Ciências Integradas com o Inglês – Holistic Approach in the Portuguese Education System to Develop Literacies of Science Integrated with English." *Indagatio*

Didactica, vol. 8, no. 1, 2016, pp. 1975-992. revistas.ua.pt/ index.php/ID/article/view/3981/3663. Accessed 11 Feb. 2018.

---. "The Language Focus of Science Education Integrated with English Learning." *Enseñanza de las Ciencias*, vol. Extra, 2017, pp. 399-404, ddd.uab.cat/record/184622. Accessed 11 Feb. 2018.

Roberts, Douglas A., and Rodger W. Bybee. "Scientific Literacy, Science Literacy, and Science Education." *Handbook of Research on Science Education Volume II*, edited by Norman G. Lederman and Sandra K. Abell, Routledge, 2014, pp. 545-58.

Scott, Philip H., et al. "The Tension between Authoritative and Dialogic Discourse: A Fundamental Characteristic of Meaning Making Interactions in High School Science Lessons." *Science Education*, vol. 90, no. 4, 2006, pp. 605-31, doi:10.1002/sce.20131.

Simões, Raquel A., et al. "The Project English Plus: A CLIL Approach in a Portuguese School." *Indagatio Didatica*, vol. 5, no. 4, 2013, pp. 30-51, revistas.ua.pt/index.php/ID/ article/ viewFile/ 2565/2430. Accessed 11 Feb. 2018.

Tedick, Diane J., and Laurent Cammarata. "Content and Language Integration in K-12 Contexts: Student Outcomes, Teacher Practices, and Stakeholder Perspectives." *Foreign Language Annals*, vol. 45, no. 51, 2012, pp. S28-S53, doi:10.111/j.1944-9720.2012.01178.x.

Ting, Yen-Ling Teresa. "CLIL Appeals to How the Brain Likes its Information: Examples from CLIL-(Neuro)Science." *International CLIL Research Journal*, vol. 1, no. 3, 2010, pp. 3-18, www.icrj. eu/ 13/ article1.html. Accessed 11 Feb. 2018.

Vieira, Rui M., et al. *A Educação em Ciências com Orientação CTS. Atividades para o Ensino Básico*. Areal Editores, 2011.

Wellington, Jerry, and Jonathan Osborne. *Language and Literacy in Science Education*. Open UP, 2001.

Wolff, Dieter. "The European Framework for CLIL Teacher Education." *Synergies Italie*, vol. 8, 2012, pp. 105-16, gerflint.fr/Base/Italie8/dieter_wolff.pdf. Accessed 11 Feb. 2018.

Desenvolvimento Curricular e Didática

VSIACTS

Abordagem holística no sistema educativo português para desenvolver a(s) Literacia(s) das Ciências integradas com o Inglês

Holistic approach in the Portuguese education system to develop Literacies of Science integrated with English

Valentina Piacentini
Centro de Investigação "Didática e Tecnologia na Formação de Formadores" (CIDTFF), Departamento de Educação e Psicologia (DEP), Universidade de Aveiro (UA), Portugal
valentina.piacentini@ua.pt

Ana Raquel Simões
Centro de Investigação "Didática e Tecnologia na Formação de Formadores" (CIDTFF), Departamento de Educação e Psicologia (DEP), Universidade de Aveiro (UA), Portugal
anaraquel@ua.pt

Rui Marques Vieira
Centro de Investigação "Didática e Tecnologia na Formação de Formadores" (CIDTFF), Departamento de Educação e Psicologia (DEP), Universidade de Aveiro (UA), Portugal
rvieira@ua.pt

Resumo:

Numa orientação CTS do currículo de Ciências almeja-se o desenvolvimento da literacia científica dos alunos, que os torne sujeitos participantes envolvidos na discussão responsável de questões socio-científicas. Para participar, é fundamental saber comunicar sobre as Ciências e através delas, e usar outras línguas para a discussão ao nível global. Este trabalho – alicerçado numa perspetiva socio-construtivista da aprendizagem das Línguas estrangeiras e das Ciências – visa compreender, no âmbito de um projeto escolar no 3.º Ciclo do Ensino Básico, o cruzamento entre a construção de conceitos e contextos das Ciências com a(s) sua(s) "língua(s)" e a prática do Inglês na mesma sala de aula, através de uma abordagem que confere mais importância à Língua (CLIL), em geral e das Ciências. Trata-se de um estudo de caso descritivo-interpretativo que envolve quatro turmas, duas professoras de Ciências Naturais e uma de Inglês. Os dados foram recolhidos através de inquérito por entrevista (professoras) e por questionário (alunos) e através da observação. Serão apresentadas as respostas dos alunos às questões relacionadas com as Ciências, o Inglês e a sua articulação, e integradas com as informações preliminares resultantes de observações, as quais pretendem caraterizar o contexto. Recorreu-se à análise de conteúdo para interpretar as respostas abertas e à análise estatística para as fechadas. Emergem evidências de que esta abordagem fomenta a comunicação e consciencialização em e sobre Ciência. Considera-se oportuno continuar a recolha/análise dos dados para um cruzamento mais complexo das fontes, e para aprofundar como a presença de uma outra língua pode enriquecer a cultura científica.

Palavras-chave: Educação em Ciências; literacia científica; Inglês; CLIL/AILC (*Content and Language Integrated Learning* / Aprendizagem Integrada de Línguas e Conteúdos).

Abstract:

The goal of an STS-oriented Science curriculum is to develop students' scientific literacy that makes

Desenvolvimento Curricular e Didática

VSIACTS

Indagatio Didactica, vol. 8(1), julho 2016 ISSN: 1647-3582

them fully engaged participants in the responsible discussion of socio-scientific issues. Participation fundamentally requires the ability to communicate about and by means of Science, as well as the use of other languages in international discussions. This work – framed in a socio-constructivist perspective of both foreign Language and Science learning – aims to understand, within a school project of 7th, 8th and 9th grades, the intersection between the construction of Science concepts and contexts with its "language(s)" and the practice of English in the same class, through an approach that confers more importance to Language (CLIL), in general and that of Science, in particular. This descriptive-explanatory case study involves four classes, two Natural Science teachers and one English teacher. Data has been collected through (teacher) interviews, a (student) questionnaire and observation. Student's answers to questions related to Science, English and their combination will be shown and integrated with preliminary information resulting from observations, aimed at characterizing the context. Content analysis has been used for interpreting open-ended answers while statistical analysis was employed on the close-ended ones. There is evidence that this approach fosters communication and awareness of and about Science. Data collection/analysis should be continued for a more complex source correlation, and to enhance the understanding on how the presence of another language may enrich the scientific culture.

Key words: Science education; scientific literacy; English; CLIL (Content and Language Integrated Learning).

Sommario:

In un orientamento STS del curricolo di Scienze é auspicabile che si lavori allo sviluppo della *literacy* scientifica degli alunni, affinché questi diventino soggetti impegnati nella partecipazione alla discussione responsabile di questioni socio-scientifiche. Per partecipare, è fondamentale che si sappia comunicare di e tramite le Scienze, e utilizzare altre lingue per discutere a livello globale. Questo lavoro – basato su una prospettiva socio-costruttivista dell'apprendimento delle Lingue straniere e delle Scienze – ha come obiettivo comprendere, nell'ambito di un progetto scolastico nella Scuola Secondaria di I grado, l'intersezione tra la costruzione di concetti e contesti delle Scienze con la/le sua/sue "lingua/lingue" e la pratica dell'Inglese nella stessa aula, mediante un approccio che conferisce più importanza alla Lingua (CLIL), in generale e delle Scienze. Si tratta di uno studio di caso descrittivo-interpretativo che coinvolge quattro classi, due insegnanti di Scienze naturali e una di Inglese. I dati sono stati raccolti attraverso interviste (insegnanti), questionario (studenti) e osservazioni. Saranno presentate le risposte degli alunni alle domande legate alle Scienze, all'Inglese e alla loro articolazione, e integrate con le informazioni preliminari, risultanti dall'osservazione, finalizzata a caratterizzare il contesto. È stata utilizzata l'analisi del contenuto per l'interpretazione delle risposte aperte e l'analisi statistica per quelle chiuse. Sussistono alcune evidenze che questo approccio favorisce la comunicazione e la consapevolezza riguardo la Scienza. È opportuno continuare a raccogliere/analizzare i dati per un incrocio delle fonti più complesso, e per approfondire come la presenza di un'altra lingua possa arricchire la cultura scientifica.

Parole chiave: Didattica delle Scienze; *literacy* scientifica; Inglese; CLIL (Apprendimento Integrato di Lingua e Contenuto).

Desenvolvimento Curricular e Didática

Indagatio Didactica, vol. 8(1), julho 2016 ISSN: 1647-3582

Introdução

A Educação em Ciências é um 'valor público' para o desenvolvimento social, económico e sustentável das sociedades (Martins, 2014). Para tal, advoga-se a superação do conhecimento científico limitado a factos e fórmulas para os alunos se tornarem sujeitos literatos, capazes de: (i) integrar conceitos e processos científicos adquiridos na escola com o dia a dia, (ii) (re)utilizar estratégias de aprendizagem fora da sala de aula, (iii) interpretar e avaliar a informação de pendor científico, e (iv) tomar decisões responsáveis no que diz respeito a questões socio-científicas (Vieira, Tenreiro-Vieira, & Martins, 2011; Holbrook & Rannikmae, 2009). A promoção da literacia científica é o que se almeja com a organização de um currículo de Ciências com orientação CTS (Vieira et al., 2011).

A participação no quotidiano – princípio assente nos vários entendimentos de literacia – pressupõe que as pessoas saibam comunicar, adequada, colaborativa e eficazmente. Contudo, consideramos que pouca atenção tem sido dirigida na escola à relevância que a língua e as representações têm na Educação em Ciências e na Ciência em geral, embora a (falta de) compreensão da língua possa constituir uma barreira à aprendizagem nas aulas de Ciências (Wellington & Osborne, 2001) e o desenvolvimento da literacia científica implique ler, escrever e argumentar com a língua e as disposições dos cientistas (Pearson, Moje, & Greenleaf, 2010; Sanmartí, 2007). Paralelamente, o reconhecimento da importância das competências de comunicação expressa-se na introdução, a partir do ano letivo 2015-2016, da aprendizagem obrigatória da língua inglesa nos primeiros anos de escolaridade[1]. O Inglês é, hoje em dia, a *lingua franca* da tecnologia e multimédia, bem como da comunidade científica internacional, e de muitos programas de divulgação (científica e não). Utiliza-se frequentemente o Inglês como língua da comunicação entre pessoas de nacionalidades diferentes, o que pode promover intercâmbios culturais. Ser competente nesta língua é fundamental no ensino superior, sobretudo nos cursos científicos, bem como na mobilidade profissional (Marsh, 2012).

Deste modo, emerge a necessidade de os ambientes escolares serem concebidos como contextos concretos, colaborativos e significativos para a aprendizagem do Inglês e das Ciências, onde os saberes não pertençam a compartimentos estanques mas sejam mobilizados e integrados para os aprendentes serem 'pluriliteratos' cientificamente. Nestes ambientes, quer na língua materna quer numa outra, podem desenvolver-se a literacia científica e as modalidades múltiplas de comunicação das Ciências (Meyer, Coyle, Halbach, Schuck, & Ting, 2015). Para sustentar a compreensão de como a construção do conhecimento científico se desenvolve através da língua e de outras modalidades comunicativas (Scott, Mortimer, & Aguiar, 2006), é necessária uma maior colaboração entre investigadores de linguística aplicada e os de didáticas curriculares (Nikula, Dalton-Puffer, & Llinares, 2013). Com efeito, as investigações sobre aulas de Ciências articuladas com o Inglês na Europa são maioritariamente objeto de estudo de revistas científicas da área de línguas.

Assim, o nosso trabalho assume-se como relevante, ao investigar o cruzamento didático-metodológico entre a construção de conceitos e contextos das Ciências com as suas linguagens e a prática do Inglês na mesma sala de aula, no âmbito de um projeto escolar no Ensino Básico

[1] Destaca-se que, em Portugal, só recentemente foi avaliado (PEPC 1308/2014) o projeto quadrienal "Ensino Bilingue Precoce em Inglês no 1.º CEB", no qual a aprendizagem de uma disciplina não linguística é integrada com a da língua inglesa.

Indagatio Didactica, vol. 8(1), julho 2016 ISSN: 1647-3582

português. Todavia, neste contexto específico iremos focar-nos nas perceções dos alunos sobre a aprendizagem em Ciências, também ligadas ao Inglês, descrevendo dificuldades de aprendizagem e possibilidades de melhorá-la e destacando as potencialidades da articulação das Ciências com o Inglês, com a finalidade de promover também uma orientação cultural no ensino e na aprendizagem das Ciências.

Contextualização teórica

O enfoque do nosso estudo é o CLIL[2] (*Content and Language Integrated Learning*), um conjunto de estratégias através das quais os currículos não linguísticos (o significado subjacente de "*content*" não é "conteúdos", mas "argumentos" e "temas" ligados a uma dada área disciplinar) são aprendidos de forma integrada com uma língua estrangeira ou segunda. Esta abordagem – fundada nos princípios teóricos e metodológicos da imersão linguística típica de países bilingues como o Canadá – foi proposta na década de 90 para fomentar a aprendizagem das línguas europeias nos cidadãos europeus. Nos últimos 15 anos, as correspondentes linhas de investigação/intervenção têm alargado o interesse à aprendizagem das línguas pelo seu uso (para interagir e fazer sentido) nas aulas da disciplina específica (Nikula et al., 2013), até aos processos de 'construção do conhecimento' através de e não (apenas traduzidos) numa outra língua.

Como realçado por Wellington e Osborne em "*Language and Literacy in Science Education*" (2001), nas aulas de Ciências é importante que os professores trabalhem quer a maneira como a língua (materna) se usa quer como esta se aprende a usar. A este respeito, os professores CLIL de Ciências, ao trabalharem a língua, as linguagens e a comunicação na e para a disciplina, estão também a inovar a Didática das Ciências (Grandinetti, Langellotti, & Ting, 2013). De facto, como salientado por Marsh, o 'desafio' colocado pelo 'trabalho' com uma língua adicional tem encorajado no professor o tornar-se consciente das necessidades (linguísticas) dos aprendentes, a preparação/utilização de recursos diversificados, transparentes e relevantes para eles, em suma, 'abordagens de qualidade' na didática (2012), quando o professor (de Ciências) se encontra a trabalhar num contexto (o das Línguas) onde não é experiente (Blanchard, Masserot, & Holbrook, 2014).

Ainda existem 'padrões de atuação' que remetem para práticas transmissivas e reprodutivas, neste contexto metodológico (Escobar Urmeneta & Evnitskaya, 2014; Meyer et al., 2015; Nikula et al., 2013). Relativamente à Educação em Ciências na atualidade, Blanchard et al. (2014) apontam como constrangimentos, entre outros, a Educação em Ciências "ser considerada mais um ramo da ciência do que da educação" (p. 79) e o facto da prática das Ciências na escola "raramente refletir questões e preocupações na sociedade" (p. 80). Se tencionamos superá-los, é preciso identificar as práticas docentes no seu contexto e trabalhar nelas de forma colaborativa com os professores. Para os alunos articularem conhecimentos, capacidades de pensamento e o uso da língua, gradualmente e ao nível quer conceptual quer comunicativo, deve-se centrar a aprendizagem neles e procurar desenvolver uma "cultura" da literacia com os professores (Meyer et al., 2015).

Para a articulação pedagógico-didática das aulas de Ciências com o Inglês e o Português, os

[2] AICLE (*Aprendizaje Integrado de Contenidos y Lenguas Extranjeras*), em espanhol; EMILE (*Enseignement de Matières par l´Intégration d´une Langue Étrangère*), em francês.

Indagatio Didactica, vol. 8(1), julho 2016 ISSN: 1647-3582

possíveis princípios norteadores residem no referencial CLIL dos 4Cês (Coyle, Hood, & Marsh, 2010): os **C**onhecimentos relativos à disciplina (conceitos e processos a serem trabalhados à luz de temas de sustentabilidade, como recomendado pela UNESCO) devem ser desenvolvidos juntamente com os âmbitos **C**omunicativo (léxico e gramática contextual; a língua para definir, inferir, questionar, argumentar, etc.; a língua requerida nos trabalhos e que surge da interação) e **C**ognitivo (incluindo o 'pensamento crítico' para construir e desafiar a aprendizagem). Através da 'comunicação colaborativa' de temas e questões, e no relacionamento com os outros, com a história e as culturas, com o ambiente, configuram-se os contextos **C**ulturais que, portanto, oferecem verdadeiros aspetos societais para construir valores e atitudes de sustentabilidade.

É nesta perspetiva de cariz socio-construtivista em relação à aprendizagem das Línguas – que postula que estas se aprendem, enquanto se utilizam, em atividades sociais colaborativas (Escobar Urmeneta & Evnitskaya, 2014; Morton, 2012) – que se pretende alicerçar uma Educação em Ciências que se prenda com a 'mudança conceitual', tendo em conta os sentidos comuns dos alunos para integrá-los no(s) ponto(s) de vista científico(s), pela socialização e construção através de uma abordagem dialógica que envolva os aprendentes (Scott et al., 2006). Deste modo e como advogado pelo quadro dos 4Cês acima referido, as aulas CLIL de Ciências com o Inglês podem ser ambientes de aprendizagem que abrem, "[através de outra língua], uma perspetiva diferente […] podendo melhorar a compreensão [da própria Ciência]" (Blanchard et al., 2014, p. 81) e em que nos é possível desenvolver um pensamento "interdisciplinar fundamental para a compreensão do mundo na sua globalidade e complexidade" (Vieira et al., 2011, p. 17).

Isto poderá envolver os alunos no estudo das Ciências e tornar a sua aprendizagem mais relevante, de acordo com autores fautores de uma abordagem humanista-cultural à Ciência e Tecnologia (Aikenhead, 2004). Igualmente, justifica-se o foco na língua para a Educação em Ciências, se considerarmos que o ensino formal desta poderá constituir o maior contributo para o desenvolvimento da cidadania (Wellington & Osborne, 2001).

Metodologia

No âmbito mais amplo de um doutoramento ainda em curso (financiado pela Fundação para a Ciência e a Tecnologia com a bolsa SFRH/BD/102895/2014), as questões que norteiam a investigação são: 1. como é que se pode articular, ao nível metodológico, o ensino e a aprendizagem das Ciências com a aquisição do Inglês, para uma aprendizagem integrada e plural?; 2. que orientações sobre esta integração podem ser formuladas para a realidade do sistema educativo português?

Visando uma compreensão e interpretação do processo de integração das Ciências e do Inglês no contexto escolar, com os seus protagonistas e as suas caraterísticas, o nosso trabalho de investigação enquadra-se no paradigma fenomenológico-interpretativo, sendo que o envolvimento dos participantes ao nível de problematização e reflexão sobre modelos teóricos e abordagem adotada favorece a conscientização que poderá levar a mudanças nas práticas de ensino e aprendizagem. Para tentar dar repostas às questões, iniciámos a definição de um estudo de caso descritivo-interpretativo, no 3.º Ciclo do Ensino Básico numa escola do Distrito de Aveiro, na qual as Ciências Naturais (CN) são ensinadas-aprendidas quer em Português quer em Inglês através do projeto "*English Plus*" (EP) [3], baseado na lógica do CLIL.

[3] O projeto EP nasceu na mesma escola, sob a iniciativa de uma professora de Inglês, com a articulação de

Indagatio Didactica, vol. 8(1), julho 2016 ISSN: 1647-3582

Mais especificamente, estão envolvidas no estudo empírico duas professoras de CN – uma no primeiro ano de participação no EP e com turmas do 7.º ano, outra já com alguma familiarização no projeto e com turmas do 8.º e 9.º anos – e algumas das suas turmas (duas do 7.º e duas do 8.º, ao primeiro e segundo ano de EP, respetivamente). Outra participante é a professora de Inglês que desencadeou o projeto EP, comum às turmas ditas e cujo papel é central no apoio à planificação/dinamização de algumas aulas de CN com a respetiva professora e das "horas de projeto" de Inglês sobre as Ciências. A recolha dos dados foi efetuada através de um inquérito por entrevista às professoras de CN e Inglês e de um inquérito por questionário aos alunos; bem como de observações (participantes e/ou não) das salas de aula e de sessões de planificação (em média, uma observação por semana durante quatro meses), ainda a decorrer. Para os fins deste artigo, servir-nos-emos dos dados correspondentes ao questionário aos estudantes, utilizando as informações das observações como fonte secundária para complementar a apresentação/discussão dos resultados.

Após as fases de validação por *experts* (duas investigadoras em Educação, das áreas de Línguas e Ciências, que validaram de maneira independente) e de pilotagem (com uma turma no mesmo ciclo de ensino numa outra escola do distrito, envolvida num projeto parecido), o inquérito por questionário foi aplicado, através do formulário disponibilizado no *Google Drive*[4], a duas turmas do 7.º ano (44 respondentes) e a duas do 8.º (52 respondentes), no final do primeiro período. Este instrumento consta de 22 questões, metade de repostas fechadas ou curtas, outra metade de respostas abertas. Os dados recolhidos com as questões de resposta aberta (Q6, Q9, Q12, Q14, Q15) foram analisados recorrendo à técnica de análise de conteúdo, com construção indutiva das categorias: em momentos distintos a investigadora tem definido, a partir dos dados, os vários domínios de análise, depois revistos e integrados de maneira independente pelos dois orientadores. Para os restantes dados (Q13, Q16, Q17, Q18, Q19 e Q19.1), utilizou-se o *software* SPSS 21 para um tratamento estatístico descritivo, com cálculos de frequências e percentagens e construção dos relativos gráficos. Em ambas as análises, as respostas foram analisadas separando os dados entre os dois anos, embora os resultados sejam apresentados de forma disjunta (isto é, as respostas às questões Q13, Q14 e Q15 podem depender da metodologia da professora, mais do que outras) ou global, conforme o caso. As questões selecionadas para a divulgação neste artigo remetem para informações relevantes para o desenvolvimento da articulação didática entre Ciências e Inglês.

Com este trabalho pretende-se, em concreto, identificar as perceções dos aprendentes relativamente: (i) ao projeto "*English Plus*" em Ciências; (ii) às dificuldades sentidas nos âmbitos da Educação em Ciências que também implicam a utilização de língua(s) e (iii) às sugestões fornecidas às professoras para melhorar a aprendizagem; (iv) à articulação entre Ciências e Inglês no dia a dia; e (v) à importância que a aprendizagem das Ciências detém. Por último, tenciona-se procurar integrar estas informações com algumas práticas/ideias salientadas na análise (ainda em fase de organização) das observações, para desenvolver uma primeira caraterização do projeto *CLIL-type* EP em Ciências e de como as "culturas" das suas dimensões científica e linguística se possam apoiar reciprocamente, contribuindo para uma orientação CTS.

História com Inglês e foi acompanhado, em relação às perceções dos *stakeholders* – entre 2010 e 2012 por uma equipa do CIDTFF, Aveiro (Simões, Pinho, Costa, & Costa, 2013).

[4] Disponível para visão na ligação http://goo.gl/forms/ls5tXdzQNc.

Desenvolvimento Curricular e Didática

Indagatio Didactica, vol. 8(1), julho 2016 ISSN: 1647-3582

Resultados: apresentação e discussão

Projeto EP, Ciências Naturais e Inglês

Este projeto é considerado, globalmente, de grande importância pelos alunos (Q18, "Como consideras o Projeto 'English Plus' em Ciências?"): numa escala de 5 + 1 ("Não sei") valores, 54% e 36% considera-o "Muito importante" e "Importante", respetivamente, indiciando que os alunos se sentem parte de um projeto de aprendizagem. Com respeito à consideração se o EP possa contribuir para a melhoria da aprendizagem, os alunos do 7.º ano são mais positivos do que os do 8.º (Gráfico 1, Q19), que também expressam alguma perplexidade (15%), provavelmente por uma forma de cautela já que se encontram no segundo ano de projeto e no processo de avaliação da própria aprendizagem.

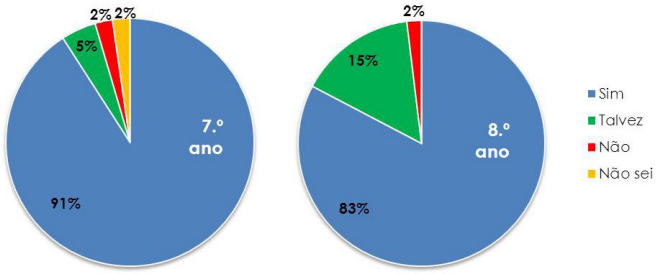


Gráfico 1. "Pensas que o Projeto 'English Plus' em Ciências pode contribuir para a melhoria das tuas aprendizagens?" (à esquerda, o 7.º; à direita, o 8.º).

Ao indicarem em que disciplinas a aprendizagem melhorará, existe uma certa concordância entre alunos do 7.º e 8.º anos sobre a melhoria da aprendizagem em Ciências, sendo que os alunos com mais experiência referem mais o Inglês (Gráfico 2, Q19.1), cuja aprendizagem pode ser comprovada com mais facilidade do que nas Ciências pelo possível nível de comunicação acrescido de um ano para outro no mesmo ciclo de ensino.

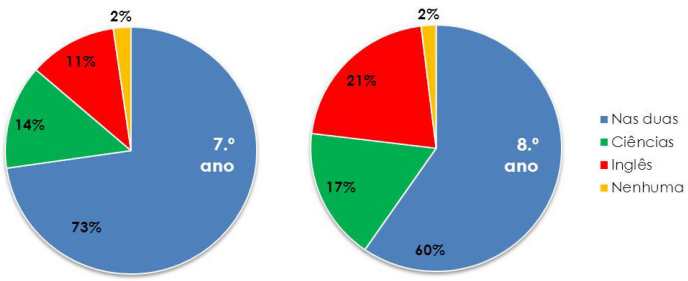


Gráfico 2. "Em que disciplina(s) [haverá melhoria da aprendizagem]?" (à esquerda, o 7.º; à direita, o 8.º).

Indagatio Didactica, vol. 8(1), julho 2016 ISSN: 1647-3582

De maneira semelhante, a auto-avaliação dos alunos (total, 96: 44 no 7.º e 52 no 8.º) concentra-se no "Bom" e "Suficiente" para as Ciências, enquanto que no Inglês se dispersa mais (Gráfico 3, Q16 e Q17), ou seja, os alunos mostram uma capacidade maior de discriminação avaliativa na disciplina linguística que na outra, para a qual parece existir mais cuidado, talvez devido à forma como as Ciências são percebidas (Aikenhead fala de "mitos sobre a Ciência e os cientistas") e/ou às diferentes modalidades de avaliação das professoras de Ciências e de Inglês.

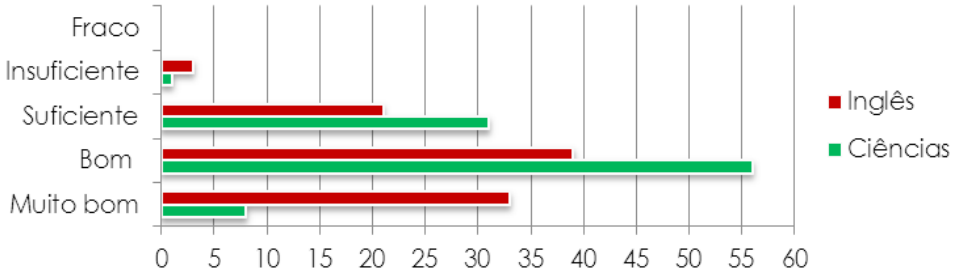


Gráfico 3. "Como te avalias enquanto aluno de Ciências/Inglês?" (valores absolutos): a escala de avaliação do eixo vertical é a mesma utilizada na escola dos alunos; as frequências resultam das respostas agrupadas dos alunos do 7.º e 8.º anos.

Salienta-se que os alunos do 7.º se avaliam em Ciências tendencialmente com "Suficiente" e os do 8.º com "Bom", resultando em 45% vs 21% no primeiro caso e 71% vs 43% no segundo: uma situação que se pode prender quer com a idade dos alunos quer com a diferença de (metodologia da) professora de Ciências, como também descrito nas seções abaixo e realçado pelas observações.

Dificuldades na aprendizagem das Ciências

Quando respondem acerca das próprias dificuldades na aprendizagem das Ciências (Q13, "Como descreves as tuas dificuldade(s) na aprendizagem das Ciências?"), em relação aos vários aspetos (estratégias, atividades, recursos, etc.) típicos da Didática das Ciências, numa escala de 5 + 1 ("Não percebo") valores, a situação configura-se para os alunos dos dois níveis como mostrado nos Gráficos 4 (dificuldades no 7.º ano) e 5 (dificuldades no 8.º ano):

Indagatio Didactica, vol. 8(1), julho 2016 ISSN: 1647-3582

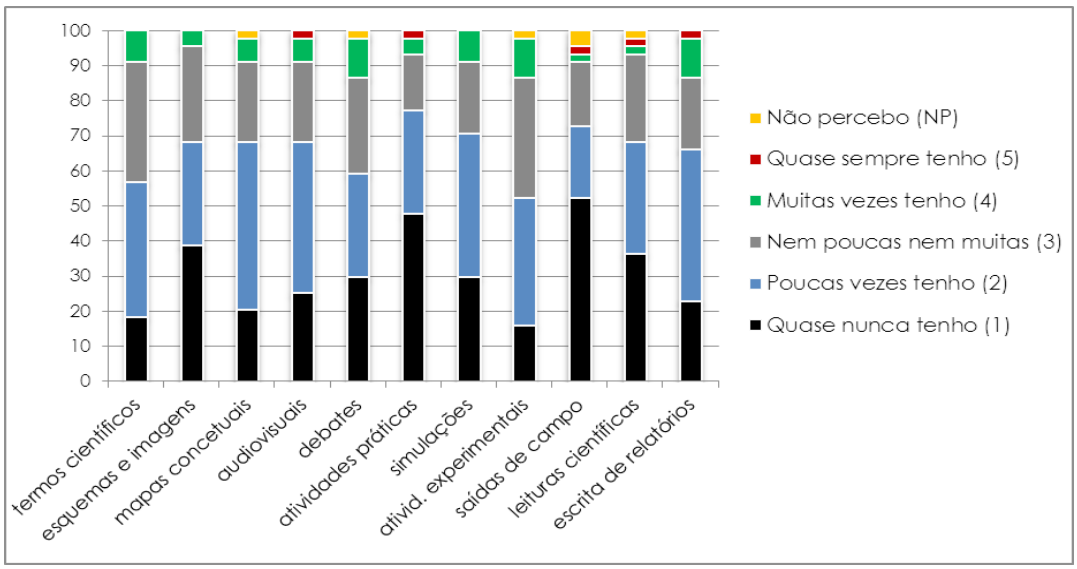


Gráfico 4. Dificuldades no 7.º ano em Ciências (valores percentuais): a legenda mostra a escala tal como apresentada no questionário; no eixo horizontal, são indicados os aspetos da Q13, em forma sintética.

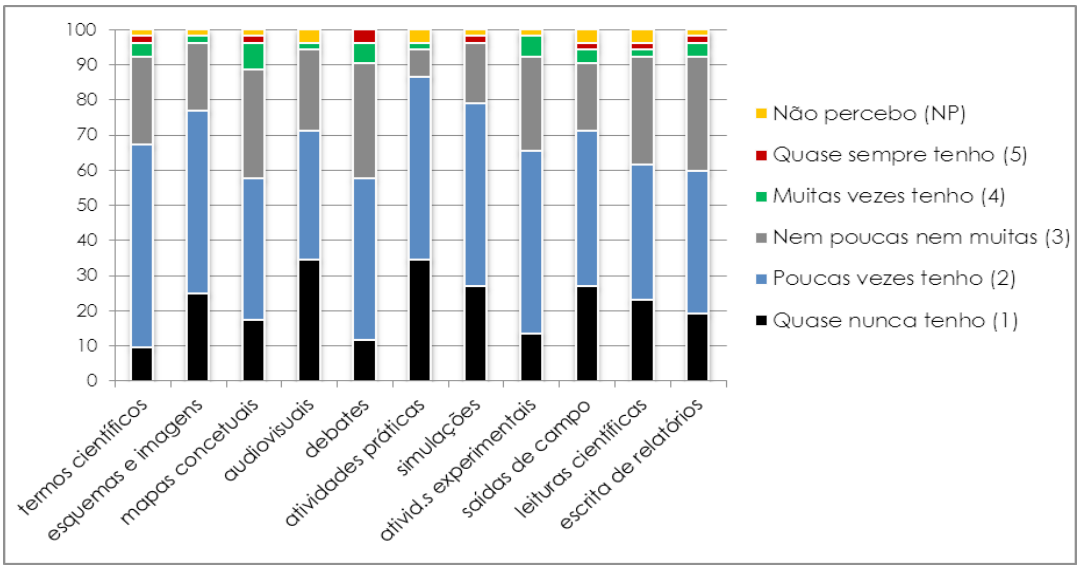


Gráfico 5. Dificuldades no 8.º ano em Ciências (valores percentuais): a legenda mostra a escala tal como apresentada no questionário; no eixo horizontal, são indicados os aspetos da Q13, em forma sintética.

Foram calculadas as percentagens para cada ponto da escala, considerando como total das respostas o número de alunos por nível (44 no 7.º e 52 no 8.º) a multiplicar o número dos aspetos (11). Para o 7.º ano (total de respostas, 484), resultam os seguintes valores: (1), 31%; (2), 36%; (3), 24%; (4),

Indagatio Didactica, vol. 8(1), julho 2016 ISSN: 1647-3582

7%; (5), 1%; (NP), 1%. No caso do 8.º ano (total das respostas, 572), as percentagens são as seguintes: (1), 22%; (2), 47%; (3), 24%; (4), 3%; (5), 1%; (NP), 2%.

Um primeiro aspeto que vale a pena destacar é a maior dispersão dos alunos do 7.º ano em comparação com os do 8.º: as dificuldades dos alunos mais novos distribuem-se entre "quase nunca …" (31%), "poucas …" (36%) e "nem poucas nem muitas" (24%), ficando concentrada no "poucas …" (quase na metade das respostas) no caso dos mais velhos, isto é, os do 8.º não detetam problemas no geral mas são mais ponderados na declaração das próprias (falta de) dificuldades; também, há mais respostas (14 no 7.º *vs* 6 no 8.º) que admitem "Não percebo". É possível explicar este facto com uma diferente noção das dificuldades na aprendizagem que os alunos têm durante os vários anos de escolaridade; porém, também se poderia atribuir às estratégias utilizadas pelas duas professoras de Ciências nos dois níveis, maiormente diversificadas pela do 7.º ano (informação resultante da observação das aulas).

Onde os alunos mais velhos reconhecem mais dificuldades é na "participação em debates" e na "construção de mapas de conceito", atividades que requerem aquisição de conhecimentos e também um uso da língua (argumentação oral num caso e organização escrita no outro) mais complexo (como também a "leitura…" e a "escrita…"), ao contrário do manuseamento de materiais em atividades práticas. Isto reforça a ideia de que a língua é importante para a ciência (Wellington & Osborne, 2001). Em relação às maiores dificuldades dos alunos mais novos, as atividades experimentais, observadas nas aulas práticas de CN, representam contextos científicos de alta ordem cognitiva (requerendo capacidade de questionamento e argumentação), da mesma maneira que os próprios debates e a "compreensão de termos científicos" em que estes alunos têm menos experiências. Ao envolverem uma aprendizagem *hands-on*, as atividades práticas e as saídas de campo são lhes mais acessíveis.

Sugestões para melhorar as aprendizagens

Quando os alunos são chamados (Q14 e Q15) a indicar algumas sugestões à professora de Ciências (diferente no 7.º e 8.º anos) e à de Inglês (a mesma para os dois níveis), abre-se um espaço de sugestões, organizado no quadro a seguir:

Indagatio Didactica, vol. 8(1), julho 2016 ISSN: 1647-3582

Quadro 1. "Indica a(s) sugestão(ões) que gostarias de dar à professora para poderes aprender melhor Ciências/Inglês".

Professoras / **Sugestões**	CN no 7.º	CN no 8.º	Inglês para o 7.º	Inglês para o 8.º
Aulas práticas, experiências [Ciências]				
Visitas de estudo [Ciências]				
Diversificação de estratégias em sala de aula [Inglês]				
Apresentação e tratamento dos conteúdos				
Postura em sala de aula				
Língua(s) utilizada(s)				

Assinala-se que o vermelho está associado às sugestões mais frequentes para cada professora, enquanto o cinzento e o verde às sugestões referidas media e escassamente pelos alunos. Na primeira coluna é apresentada uma versão sintética das categorias criadas com base nas respostas dos alunos.

No 7.º ano, o que os alunos sugerem à professora de Ciências é, sobretudo, uma utilização maior de esquemas, tabelas e fichas (alguns dos recursos indicados e categorizados na "apresentação e tratamento dos conteúdos"), ou seja, uma representação visual das informações relativas à disciplina para ajudar na compreensão e sistematização. Como observado nas aulas de CN em Inglês, esta prática de representação é marcadamente presente na professora de língua (que simboliza, desenha e resume os sentidos e conceitos da disciplina científica). No 8.º, salienta-se que uma grande parte dos alunos sente a falta de atividades mais laboratoriais. Efetivamente, ao longo das observações foi detetada uma escassa realização de atividades que envolvem estratégias e recursos que vão para além das aulas mais teóricas. Quanto ao Inglês, os alunos mais novos requerem uma diversificação de estratégias em sala de aula para promover a compreensão e/ou a participação, revelando uma necessidade de maior interação através da língua, observada com mais frequência, de facto, nos anos seguintes. Vice-versa, os alunos mais velhos pedem à professora de Inglês mais consolidação dos conteúdos linguísticos através de exercícios e revisões, talvez para ordenar o que emerge do nível propriamente comunicativo.

É necessário precisar que "língua(s) utilizada(s)" se refere à presença quer do Inglês quer do Português nas aulas (teóricas) de Ciências Naturais do EP e às sugestões dos alunos para que haja uma articulação mais clara entre as duas (para a professora de CN no 7.º ano), se fale Inglês mais

Indagatio Didactica, vol. 8(1), julho 2016 ISSN: 1647-3582

devagar e com mais tradução para Português (para a professora de Inglês por parte dos dois níveis) ou decorram mais situações nas que os alunos possam interagir com pessoas que falam Inglês (para a professora de Inglês por parte do 8.º): uma situação que evidentemente depende não apenas da idade dos alunos mas também das suas diversas competências em língua estrangeira, e que aponta para a exigência de um trabalho sistemático, por parte das professoras, no apoio à aprendizagem dos aspetos linguísticos e comunicativos e entre as (duas) línguas. Relativamente à "postura em sala de aula", evidencia-se a recomendação de mostrar mais calma nas explicações (CN no 7.º) e uma maior troca em termos de questões (CN no 8.º).

Articulação entre Ciências e Inglês

Em resposta à questão "Apresenta um exemplo do teu dia a dia (fora da escola) em que já 'encontraste' as Ciências ligadas ao Inglês" (Q6), os alunos expressaram ideias (alguns exemplos são citados abaixo) a partir das quais foram construídas as seguintes categorias de contextos (Quadro 2):

Quadro 2. Contextos dos alunos em que as Ciências são encontradas juntamente com o Inglês.

Categorias	Descrição	Exemplos
1) Meios de informação	Representados por televisão, revistas e jornais, *internet*, livros, enciclopédias	**A.** […] em alguns sites, enquanto fazia algumas pesquisas **B.** Na televisão vejo que praticamente todos os cientistas são Ingleses **C.** […] Quando vejo programas sobre a ciência encontro palavras que aprendi na escola **D.** Em casa a ver um programa em Inglês sobre os predadores e as presas na savana
2) Visitas em instituições culturais e similares	Incluindo visitas aos museus de ciência, parques na natureza, etc.	**A.** Eu estava de férias e fui a um parque de plantas e como havia muitos turistas o guia estava a explicar as coisas em inglês **B.** Um dos exemplos em que já encontrei a [*sic.*] ligadas ao Inglês foi quando nós fomos ao Arouca Geopark **C.** Quando vou para um país estrangeiro e vou fazer uma visita guiada e o orientador faz uma pergunta a haver [*sic.*] com Ciências e nessas ocasiões que tenho que usar o Inglês e as Ciências

Indagatio Didactica, vol. 8(1), julho 2016 ISSN: 1647-3582

3) Contextos comerciais	Relativos ao ato de comprar, aos produtos, etc.	**A.** Caixas comerciais (brinquedos, jogos,...) relacionados com ciências, com as respetivas descrições em Inglês **B.** Muitas vezes os rótulos dos medicamentos têm termos científicos que desconheço em Português, mas que sei em Inglês
4) Contextos pessoais informais	Relativos às vivências em casa, com amigos, etc.	No meu dia-a-dia já encontrei por exemplo com amigos não portugueses tive de utilizar o inglês para conseguir contactar com eles
5) Contextos de estudo das Ciências	Associados às várias situações em que o aluno estuda Ciências	Já encontrei as Ciências ligadas ao Inglês pois muitos processos em ciências têm nomes ingleses

Nos "meios de informação" entram os casos mais referidos pelos alunos, como os documentários transmitidos em alguns canais da televisão (muitos mencionam o canal *National Geographic*). Como se evidencia no exemplo 1) B., salienta-se que muitos cientistas são considerados ingleses pelo facto de comunicar em Inglês: o Inglês é praticamente a língua mais usada pela comunidade científica internacional (ideia confirmada também na exemplificação dos "contextos de estudo das Ciências"), porém, a proveniência dos cientistas é muito diversificada, em termos de línguas e culturas, assim como uma língua não se pode associar apenas a um país (o Inglês fala-se oficialmente em vários países). O contexto das visitas a museus e parques constitui uma categoria igualmente muito representada, quer no que diz respeito às visitas que são conduzidas em Inglês pela presença de pessoas de várias nacionalidades (como em 2) A.) ou durante as quais é possível encontrar indicações (também) em Inglês, quer às visitas que fazem parte de viagens ao estrangeiro (por exemplo, 2) C.) e/ou de projetos de estudo (o caso de 2) B.): destaca-se aqui a língua inglesa usada para fins (científicos) divulgativos assim como o meio de comunicação entre pessoas de línguas diferentes (presente nos contextos pessoais também). Estes dois vieses podem estar presentes também nas páginas da *internet* (o exemplo 1) A. pode remeter para os dois). Bastante representados são, por fim, os "contextos comerciais" como caixas e instruções de produtos (jogos científicos, medicamentos, etc.), onde o Inglês é uma das línguas utilizadas ou, por vezes, a única. Vale a pena realçar que os exemplos 1) C., 2) B. e 3) B. se prendem também com o facto dos alunos estarem a participar no projeto "bilingue" EP em Ciências Naturais na escola.

Indagatio Didactica, vol. 8(1), julho 2016 ISSN: 1647-3582

Importância da aprendizagem das Ciências

Ao longo do questionário também foi pedido aos alunos para que tomassem uma posição perante as frases "Acho importante aprender … porque …" ou "Não acho importante aprender … porque …", relativamente às línguas estrangeiras[5] (Q9) e às Ciências (Q12); para além disso, foi-lhes pedido para que completassem as frases ditas. Com a excecão de um aluno que não considerou importante aprender Ciências porque "[…] só seria util [*sic.*] se escolhece-mos [*sic.*] algum curso em que ciências era necessário", todos concordam com a importância destas aprendizagens, oferecendo respostas que foram organizadas nas seguintes categorias (Quadro 3):

Quadro 3. Categorização e exemplos das respostas sobre a importância da aprendizagem em Ciências.

Categorias	Descrição	Exemplos
1) Compreensão dos fenómenos	Referência ao conhecer, perceber e saber sobre o corpo humano e o que nos rodeia, a natureza, o ambiente e o planeta	**A.** assim compreendemos melhor a natureza e tudo aquilo que nos rodeia **B.** podemos aprender mais sobre o nosso corpo e sobre a natureza e o meio ambiente **C.** para sabermos mais sobre o planeta onde vivemos e o nosso dia-a-dia
2) Cultura pessoal e geral	Consideração da relevância da Ciência para construir/desenvolver cultura	**A.** sem ela não sabia tantas coisas como sei agora **B.** ficamos mais cultos e conseguimos comprovar muitas coisas com a ciência
3) Utilidade diária dos conhecimentos	Referências ao precisar e/ou aplicar os conhecimentos adquiridos das Ciências no dia a dia	**A.** e [*sic.*] uma disciplina que nos usamos no nosso dia-a-dia **B.** no dia a dia pode ajudar-nos a resolver várias situações **C.** com as ciencias [*sic.*] consigo adquirir conhecimentos que um dia precisarei na minha vida
4) Importância para o futuro profissional	Importância referida ao futuro, académico e/ou profissional	**A.** como crianças não usamos esse conhecimento muitas vezes mas no futuro, até no nosso emprego, por exemplo, pode ser exigido **B.** se um dia quisermos ser cientistas já temos conhecimentos suficientes para isso

[5] É preciso sublinhar que as respostas sobre a aprendizagem das línguas estrangeiras (dados não mostrados neste artigo) distinguiram-se em termos de descrição das situações e complexidade dos pensamentos, revelando um 'perfil linguístico-cultural' nos alunos merecedor de uma investigação adicional.

Indagatio Didactica, vol. 8(1), julho 2016 ISSN: 1647-3582

Através desta primeira categorização foram identificados quatro domínios com os quais está ligada a importância da aprendizagem das Ciências, como mostrado e descrito na tabela. Ao focarmos a atenção nas conceções para caraterizar a relação entre 'cultura' e 'ciência' (Martins, 2002), podemos afirmar que predomina, quanto a 1), 2) e 3), a visão de "Ciência como parte da cultura" sendo que são utilizados termos e conceitos que perspetivam as 'atividades científicas' como presentes no dia a dia e no que nos rodeia e necessárias para a sociedade. Da categoria 4), assim como do posicionamento negativo do aluno acima referido, emerge a conceção de "cultura científica", própria apenas da comunidade científica e das profissões ligadas à Ciência. As respostas, seja à Q6 seja à Q12, demonstram, assim, que os alunos têm uma apreciação da aprendizagem das Ciências e das Ciências ligadas à língua inglesa que se integra na e com a cultura geral e não consta só de conhecimentos e avaliações típicos da escola. Com efeito, as respostas dos alunos a este respeito distribuem-se num amplo espectro, quando se utilizam as 'categorias da relevância' das Ciências para o currículo CTS, tendo como referência, por exemplo, Aikenhead (2004).

Vale a pena realçar que as observações das salas de aula "*English Plus*" de Ciências Naturais têm patenteado, embora seja desejável um contínuo aumento das possibilidades para os alunos "produzirem" língua, um espaço de aprendizagem onde: (i) é favorecida a comunicação sobre temas da Ciência, incrementada pelas aulas de projeto em Inglês sobre temas de cariz científico; (ii) se procura promover uma visão historicista da Ciência e dos cientistas; e (iii) o debate socio-científico é central, devido a um marcado peso dado à exigência de desenvolver a comunicação (em Inglês) nos alunos mais velhos. Nesta "integração disciplinar" é possível, portanto, reconhecer os princípios que sustentam a organização de um currículo de Ciências com orientação CTS (Vieira et al., 2011).

Considerações finais

As aulas *CLIL-type* EP de Ciências Naturais revelam-se como ambientes de aprendizagem holísticos onde se confere maior importância à comunicação, assumindo o 'foco na língua' para a Educação em Ciências advogado por Wellington e Osborne (2001): a presença do Inglês para além do Português favorece a discussão sobre a Ciência e estará a aumentar a sua relevância para os alunos. Paralelamente, a língua estrangeira encontra um contexto significativo para ser praticada. O facto de ensinar-aprender Ciências em Português nem sempre garante um entendimento dos conceitos, se é que "às vezes, uma palavra pode ser imaginada numa língua mais do que numa outra", como expressado por Blanchard et al. (2014, p. 81) e tal como algumas observações permitiram detetar. Também, resulta acrescido e melhorado o trabalho das professoras para apoiar a aprendizagem numa língua adicional (através de recursos e atividades diversificados e envolventes), fomentando a participação e a interação dos alunos, por um lado, e tornando o professor também como sujeito aprendente, e proativo na construção de um projeto/processo de mudança, pelo outro, como diversamente afirmado no processo das entrevistas.

Contudo, para o desenvolvimento da literacia científica é necessário que os alunos se tornem mais competentes na prática, compreensão e domínio da, entre outros, representação e articulação de conceitos e processos em diagramas e mapas concetuais, participação e argumentação quer nas atividades experimentais quer nos debates científicos, ou seja, de campos da Ciência e da

Indagatio Didactica, vol. 8(1), julho 2016 ISSN: 1647-3582

Educação em Ciências que implicam e requerem o uso da língua e de linguagens. Para ser literatos, antes de tudo, é preciso que os aprendentes sejam conscientes das próprias dificuldades: estas são assinaladas pelos dois níveis, 7.º e 8.º anos, mas não são ainda plenamente reconhecidas (o grupo de "não tenho dificuldades" é muito mais representado do que "sim tenho dificuldades"). Um processo de conscientização, porém, mostra-se nas sugestões para aprender melhor dadas às professoras, o que indica que os alunos são capazes de identificar pistas para a própria aprendizagem. Como salientado por Aikenhead, importa mais a capacidade de aprender como aprender do que o conteúdo de Ciências (2004).

É importante dizer que podem e devem ser abertos ainda muitos espaços de discussão, em sala de aula, para as professoras aprofundarem com os alunos as culturas da Ciência e dos cientistas, em termos de história, proveniência geográfica, sociedade (a frase "todos os cientistas são ingleses" é emblemática) para continuar a promover uma aprendizagem das Ciências que seja relevante e globalizante, e que, de forma recíproca, favoreça uma perceção das línguas como instrumento de comunicação e oportunidade de conhecimento, isto é, trabalhando nas semelhanças/diferenças entre Português e Inglês e outras línguas, também através das Ciências. Ao longo das observações durante a planificação de algumas aulas, efetivamente, foi notada uma maior preocupação das professoras de Ciências com a aquisição do vocabulário científico em Inglês do que com o reconhecimento do papel da língua nas literacias em Ciências. Na perspetiva de formação de professores é, pois, fundamental esclarecer que na abordagem CLIL não se pretende que a língua estrangeira seja falada como nativos, nem pelos professores nem pelos alunos (Lasagabaster & Sierra, 2010).

Obviamente, para enriquecer a investigação, é oportuno: conjugar este estudo com uma análise dos documentos oficiais (metas, orientações, manuais) e do professor (planificações e avaliações), para compreender como esta "integração disciplinar" é permitida e encarada; triangular as informações recolhidas até agora com as entrevistas às professoras. Também, será interessante investigar a ligação entre as atitudes dos alunos face à(s) Ciência(s) e a participação no projeto EP, e orientar as práticas destas professoras, de Ciências e de Línguas estrangeiras, mais formalmente numa direção de abordagem CTS.

Em jeito de conclusão, afirma-se que é necessária ainda investigação sobre estratégias e ambientes de aprendizagem holísticos e sobre a formação de professores para esta área. Todavia, o presente estudo configura-se como um primeiro contributo para o conhecimento sobre o apoio recíproco entre Ciências e Línguas – sendo que o Inglês oferece mais contextos societais nas aulas de Ciências e estas representam o contexto de prática significativa do Inglês – que, de facto, promove uma orientação cultural na Educação em Ciências, a qual poderá vir a apoiar os sujeitos enquanto "literatos plurais": no desenvolvimento da literacia científica também em Inglês; na construção de um relacionamento sustentável com a sociedade e o ambiente; e na aprendizagem das Ciências e da sua natureza e cultura(s).

Indagatio Didactica, vol. 8(1), julho 2016 ISSN: 1647-3582

Agradecimentos

Agradeço à Luciana Mesquita que, para além de muitos outros apoios, me levou com amizade no "universo do conteúdo", à Betina Lopes que questionou as "categorias científicas" e às minhas "tias portuguesas" (Maria de Lurdes e Zé) por terem emprestado olhos atentos e globais no texto quase final deste artigo.

Referências

Aikenhead, G. S. (2004). The Humanistic and Cultural Aspects of Science & Technology Education. In Public Awareness Education Programs of the Sciences & Humanities – Technology & Global Bioethics (PAEP) (Ed.), *11th International Organization for Science and Technology Education (IOSTE) Symposium*. Lublin.

Blanchard, B., Masserot, V., & Holbrook, J. (2014). The PROFILES Project Promoting Science Teaching in a Foreign Language. *Science Education International*, *25*(2), 78–96. Retrieved from http://files.eric.ed.gov/fulltext/EJ1032970.pdf

Coyle, D., Hood, P., & Marsh, D. (2010). The CLIL Tool Kit: Transforming theory into practice Stage 1: A shared vision for CLIL. In *CLIL: Content and Language Integrated Learning* (pp. 48–85). Cambridge: Cambridge University Press.

Escobar Urmeneta, C., & Evnitskaya, N. (2014). "Do you know Actimel?" The adaptive nature of dialogic teacher-led discussions in the CLIL science classroom: a case study. *The Language Learning Journal*, *42*(2), 165–180. Retrieved from http://www.tandfonline.com/doi/pdf/10.1080/09571736.2014.889507

Grandinetti, M., Langellotti, M., & Ting, Y.-L. T. (2013). How CLIL can provide a pragmatic means to renovate science education – even in a sub-optimally bilingual context. *International Journal of Bilingual Education and Bilingualism*, *16*(3), 354–374.

Holbrook, J., & Rannikmae, M. (2009). The meaning of scientific literacy. *International Journal of Environmental & Science Education*, *4*(3), 275–288. Retrieved from https://www.pegem.net/dosyalar/dokuman/138340-20131231103513-6.pdf

Lasagabaster, D., & Sierra, J. M. (2010). Immersion and CLIL in English: more differences than similarities. *ELT Journal*, 64(4), 367-375.

Marsh, D. (2012). *Content and Language Integrated Learning (CLIL) A Development Trajectory*. Cordoba: Servicio de Publicaciones de la Universidad de Córdoba.

Martins, I. P. (2002). Das potencialidades da Educação em Ciências nos primeiros anos aos desafios da Educação Global. In D. Universidade de Aveiro (Ed.), *Educação e Educação em Ciências* (pp. 29–46). Aveiro: Tipografia Minerva Central, Lda.

Martins, I. P. (2014). Políticas Públicas e Formação de Professores em Educação CTS. *Uni-Pluri/versidad*, *14*(2), 50–62. Retrieved from http://aia-cts.web.ua.pt/artigo.pdf

Meyer, O., Coyle, D., Halbach, A., Schuck, K., & Ting, T. (2015). A pluriliteracies approach to content

Indagatio Didactica, vol. 8(1), julho 2016 ISSN: 1647-3582

and language integrated learning – mapping learner progressions in knowledge construction and meaning-making. *Language, Culture and Curriculum*, *28*(1), 41–57. Retrieved from http://www.tandfonline.com/doi/pdf/10.1080/07908318.2014.1000924

Morton, T. (2012). Classroom talk, conceptual change and teacher reflection in bilingual science teaching. *Teaching and Teacher Education*, *28*, 101–110. Retrieved from http://sciencedirect.com/science/article/pii/S0742051X11000886

Nikula, T., Dalton-Puffer, C., & Llinares, A. (2013). CLIL classroom discourse: Research from Europe. *Journal of Immersion and Content-Based Language*, *1*(1), 70–100.

Pearson, P. D., Moje, E., & Greenleaf, C. (2010). Literacy and Science: Each in the Service of the Other. *Science*, *328*, 459–463. Retrieved from http://www.readinghalloffame.org/sites/default/files/Literary_and_Science_-_Each_in_the_Service_of_the_Other_copy.pdf

Sanmartí, N. (2007). Hablar, leer y escribir para aprender ciencia. In P. Fernández (Ed.), *La competencia en comunicación lingüística en las áreas del currículo* (pp. 103-128). Madrid: MEC.

Scott, P. H., Mortimer, E. F., & Aguiar, O. G. (2006). The Tension between Authoritative and Dialogic Discourse: A Fundamental Characteristic of Meaning Making Interactions in High School Science Lessons. *Science Education*, *90*(4), 605–631. Retrieved from http://onlinelibrary.wiley.com/doi/10.1002/sce.20131/pdf

Simões, R. A., Pinho, S. A., Costa, M. A., & Costa, R. A. (2013). The Project English Plus: a CLIL approach in a Portuguese school. *Desenvolvimento Curricular e Didáctica – Indagatio Didatica*, *5*(4), 30–51. Retrieved from http://revistas.ua.pt/index.php/ID/article/view/2565/2430

Vieira, R. M., Tenreiro-Vieira, C., & Martins, I. P. (2011). *A Educação em Ciências com Orientação CTS. Atividades para o ensino básico*. Porto: Areal Editores.

Wellington, J., & Osborne, J. (2001). *Language and Literacy in Science Education*. Buckingam/Philadephia: Open University Press.

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 77, No. 5, 2019
636

TEACHERS' VIEW OF LANGUAGE(S) IN (CLIL) SCIENCE EDUCATION: A CASE STUDY IN PORTUGAL

Valentina Piacentini, Ana Raquel Simões, Rui Marques Vieira
University of Aveiro, Portugal
E-mail: valentina.piacentini@ua.pt, anaraquel@ua.pt, rvieira@ua.pt

Abstract

The development of meaningful environments at school for the learning of Science as well as of foreign languages is an educational concern. CLIL (Content and Language Integrated Learning), aimed at the students' acquisition of both the foreign Language and specific subject Content, is an approach that may promote the learning of English in use during subject classes and could result in the improvement of conditions and practices of Science education. Research, actually, reveals that teaching methodologies aware of language – such as CLIL – and other semiotic modes implied in Science are beneficial for the learning of Science. Studying a CLIL programme ("English Plus" project, EP), in which Science is taught/learnt with/in English, is thus relevant. A case study on the EP project and its participants (English and Science teachers, students involved in different school years) in one lower secondary state school in Portugal was carried out. In the present research, qualitative data collected through teacher interviews are presented and discussed, with the goal of understanding the role of Language(s) (verbal language in the mother tongue or English and other representation modalities) in the teaching of Science for EP teachers, both in conventional and project classes. A greater teacher awareness and use of Language(s), when an additional language (English, here) is also present for Science education, results from this work. This contributes to research on CLIL Science studies and teacher reflections on adopting a language-focused approach for Science education, also when the mother tongue is spoken.
Keywords: *CLIL (Content and Language Integrated Learning), EFL (English as a foreign language), language-focused science education, qualitative design, reflections on teaching.*

Introduction

Science education has a pivotal role in the information society and for lifelong learning. It is a "public value" for social, economic and sustainable development (Martins, 2014). Unfortunately, whilst in the last century Science, Medicine and Technology have been impressively evolving, "transferability" of school Science knowledge into "comprehension" of everyday natural phenomena has been poor, as reported by PISA-OECD surveys among others. Recommendations for Science education emphasise the importance of its contextualization and of supporting learners in understanding and constructing concepts over facts and formulas for developing a scientific literacy, to understand and integrate scientific information and to take responsible decisions about socio-scientific issues (Holbrook & Rannikmae, 2009; Roberts & Bybee, 2014). Participation in the real world implies people can communicate adequately, collaboratively and effectively.

Nevertheless, relatively little attention has been devoted to the significance of the language demands in learning scientific topics (Seah & Silver, 2018), although for many students the greatest difficulty is to learn the language of Science, that is, a "range of semiotic modes available to the science teacher" and in Science in general (Wellington & Osborne, 2001, p. 7). As expressed by Lemke, "the natural language of science is a synergistic integration of words […] visual representation […] mathematical symbolism […] experimental operations [that is] 'the languages of science' in a broader sense [than just specialised languages of scientific fields]" (2003, pp. 4-6), which requires of students a "multimedia literacy" and of teachers

https://doi.org/10.33225/pec/19.77.636 ISSN 1822-7864 (Print) ISSN 2538-7111 (Online)

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 77, No. 5, 2019

awareness and support. Indeed, if formal Science education is a considerable contribution to the citizenship and public scientific understanding, a language-focused Science education is justified, as stated by Wellington and Osborne (2001). A deeper understanding of the role of these various representations[1] in developing Science knowledge and literacy is as crucial as orienting teacher education and professional practices (Tang, Delgado, & Moje, 2014; Yore & Treagust, 2006), so that the learning of the language and literacy practices become an essential part of the Science learning (Seah & Silver, 2018).

Being competent in foreign languages (albeit to varying degrees) is also fundamental (Council of Europe, 2001), not least for people participating in scientific and general discussion. Global demand for learning English and through English has been increasing (Dearden, 2014). English is the language of the international scientific community, as well as of technology and multimedia, often "assumed" in academic curricula (mainly scientific degrees), for professional mobility and cultural encounters (Dearden, 2014; Gimeno, Seiz, de Siqueira, & Martínez, 2010; Jenkins, 2015; Kaire, 2017). It can be seen as "overwhelming" worldwide Science research but the endeavour to explore factors of how the English language might support the learning of Science and vice versa is worthwhile, as discussed below. Moreover, it is nowadays viewed as "global lingua franca" rather than "one of the foreign languages", meaning that a significant teaching of English should be directed to the intercultural opportunities and bridges to other languages (without excluding the learners' mother tongue) that English can offer (Smokotin, Alekseyenko, & Petrova, 2014).

Within school environments, CLIL (Content and Language Integrated Learning), in being a language-aware and content-directed educational approach (see next section) which integrates different curricular fields, is a possible solution to provide an authentic learning of both English and Science. It may foster the development of multimodality for Science knowledge and communication, both in the native and foreign languages, if gradually and iteratively implemented (Meyer, Coyle, Halbach, Schuck, & Ting, 2015). There is still work to be done, as suggested by Scott, Mortimer and Aguiar (2006), to understand how the construction of scientific knowledge develops through language and other modes of communication. Research is also required on CLIL Science learning contexts, in which an additional language has to be learnt besides the mother tongue. Furthermore, a greater collaboration between applied linguists and researchers in subject-specific education is sought (Nikula, Dalton-Puffer, & Llinares, 2013). Most studies in CLIL Science, in fact, originate from the Language research field.

In the Portuguese context, CLIL projects and initiatives across school levels have grown in the last decade: for instance, the "English Plus" project (EP) discussed here, in which Science is taught and learnt with and in English at lower secondary school (Ellison, 2018). The corresponding research on these projects is still localised and many studies are focused on the tertiary level. The relevance of carrying out research on CLIL school programmes devoted to Science education becomes clear. More specifically, the objective of this research is to understand, from teachers involved in the EP programme, the role of Language(s)[2] in the teaching of Science, within "normal" and CLIL practice (where Portuguese and English are used, respectively). Their discussion contributes, in turn, to a reflection on language demands of (CLIL and non-CLIL) Science learning and on teaching practices, in order to improve the learning of both Science and English.

The CLIL Approach and (Non-Language) Subject CLIL Teachers

The 1995 White Paper on Education and Training reveals the importance for European citizens of competence in European languages besides their own. CLIL is indicated as one strategy to promote plurilingual and intercultural education (Beacco et al., 2010) and one possible initiative for language education, in the 2011 Civil Society Platform on Multilingualism in Europe. CLIL emerges therefore as a European solution for advancing foreign language (FL) learning, and it shares theoretical underpinnings and methodological concerns with the Canadian immersion in bilingual education (Evnitskaya & Morton, 2011). Though stemming from immersion programmes, differences have arisen over time: for instance, the "non-nativeness" of teachers and students or readapted/scaffolded teaching materials (Lasagabaster

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 77, No. 5, 2019

& Sierra, 2010), or the degree of collaboration between language and non-language teachers (Pavón Vásquez & Ellison, 2013).

According to Krashen's theory on Second Language Acquisition, languages are learnt while they are used, and CLIL classes are authentic learning environments to achieve "communicative competence in the target language through […] everyday classroom activities" (Dalton-Puffer & Nikula, 2006, p. 241). Unlike traditional FL classes, where form and structure of the foreign language are the main object of study, within CLIL settings Content (non-language, specific subject which is represented through language) and Language converge in a "dual focus" for learning and teaching, according to referential conceptualizations of CLIL as an educational approach (e.g., Coyle, Hood, & Marsh, 2010; Marsh et al., 2011). Students learn the discipline or a theme and how to use the languages of/for/through learning (the so called "language triptych", cf. Coyle).

Through code-switching, the L1 can also be present to support content learning when needed; major difficulties in the implementation of CLIL classes are caused not by using a FL, but by the lack of appropriate methodology used in class (Barbero, 2006). There is no formula for organising a CLIL programme, the context being the crucial point (Coyle, 2005). Any language can be selected, but one factor to contemplate is the characteristics of the CLIL subject as well as the degree of "proximity" between the students' mother tongue and the CLIL language: disciplines like Philosophy or Literature rely mainly on verbal communication, whereas Biology or Geography are represented also visually; one wants to guarantee that verbal density is not a learning obstacle when using a foreign language.

In Europe, CLIL teachers are usually content teachers who experience a professional and personal challenge through the language (Oattes, Oostdam, de Graaf, & Wilschut, 2018). This can increase teacher awareness of learner linguistic needs and prompt the development of quality teaching and learning strategies in CLIL-based education (Marsh, 2012). When the Science teacher ends up working in a CLIL environment, her/his own non-expertise in the foreign language might make her/him more aware of making content accessible to students and her/his relationship with them less hierarchical (Blanchard, Masserot, & Holbrook, 2014); she/he is engaged in "a constant process of rethinking the way one teaches" (Canet Pladevall & Evnitskaya, 2011, p. 176), which "may favour a more profound treatment of content" (Escobar Urmeneta & Evnitskaya, 2014, p. 178). Hence CLIL settings both provide higher FL exposure/learning and facilitate Science learning, improving Science education and performance (Grandinetti, Langellotti, & Ting, 2013).

CLIL is acknowledged as a "change agent", in converting "monolingual learning contexts into bilingual experiences" (Coyle, 2013, p. 244), and in entailing "language-sensitive content teaching" strategies favourable for preparing CLIL and non-CLIL teachers who work in CLIL-like contexts in European schools; actually, due to increasing migration, conversational and academic competence levels in the schooling language among learners are heterogeneous (Wolff, 2012). The importance of "[equipping] CLIL teachers to bear the challenge of that change" is unquestionable (Pérez Cañado, 2016, p. 217), nevertheless, triggering the change of the pedagogical approach of both language and non-language teachers, reflecting on "beliefs, values and practice" is a primary concern (Pavón Vázquez & Ellison, 2013, p. 77). The focus of research in the CLIL field is usually on benefits for the students' foreign language skills, and attitudes towards language learning, having shifted only recently to concerns related to content knowledge acquisition (Meyerhöffer & Dreesmann, 2019). Moreover, to the authors' knowledge, studies specifically directed at CLIL Science classes have not paid attention to the "flux" between the presence of English in CLIL Science classes and teacher practices within Science education in which the language of instruction is, typically, the mother tongue. This is an added value of the present study that aims, as already introduced above, at characterising the practices of "Language(s) of Science" (cf. Lemke, 2003; see note n. 2) in both non-CLIL and CLIL conditions, as related by teachers involved in a Portuguese CLIL project of Science with English.

https://doi.org/10.33225/pec/19.77.636 ISSN 1822-7864 (Print) ISSN 2538-7111 (Online)

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 77, No. 5, 2019

Research Methodology

Background

Among the CLIL initiatives in Portugal in state-run schools, the top-down "Bilingual Schools Programme"[3] in English (organised by the Ministry of Education and the British Council in Portugal) exists, currently involving 25 state school clusters from pre-primary school levels up to the 9th grade. Interested in bottom-up initiatives wherein teachers design their own CLIL contribution (timetable, strategies, material) through the curriculum, the ongoing "English Plus" (EP) project in one lower secondary school (from the 7th to the 9th grades) in Northern Portugal is described in this article. Its first edition was undertaken between 2010 and 2013 by one English and one History teacher with students of one class and monitored by the authors' research group with regard to stakeholders' perceptions. The project was reactivated in 2014-2015 for the Natural Sciences (NS), involving one Science teacher, and, since 2015-2016, a new collaboration with the same research centre was developed. During this year, out of 20 classes in the school, 2 at 7th grade, 2 at 8th and 1 at 9th were involved with two Science and two English teachers in the EP project.

Participation in the "English Plus" programme was voluntary. EP students attended, on a weekly basis: 45 minutes of theoretical NS with English (EP classes, co-teaching: the subject and the English teachers both present and using English), 45 minutes of theoretical NS mainly in Portuguese (non-EP classes, single-teaching: classes given by the non-language teacher alone) and 45 of "project time" (PT classes, also within the project: English on socio-cultural subject-related topics with the English teacher). The remaining disciplines, including practical Science classes, followed the standard curriculum. Given this specific setting, EP is referred to as a CLIL-type provision. These students were usually also "engaged" in extra-curricular activities: school trips and their organization, cinema sessions, theatre performances, "open day", etc. Science teachers could choose suitable units to teach the content topic by means of the foreign language, rather than covering the whole Science syllabus. No financial reward was provided to EP teachers.

Instruments and Procedures

Considering the specific characteristics of the project, in 2015-2016 a descriptive-explanatory case study was designed, within a PhD research project. The student participated extensively in the project and school activities and gathered perspectives from both teachers and students. The focus of this specific work is on the project teachers and their voices: two Science (one with two years' experience with the project and one in her first year of EP, in 2015-2016) and two English (one coordinating the two EP editions, one at an observation stage in 2015-2016) teachers. It is worth saying that the Science teachers learnt English mainly in private institutes and used to practice it (reading papers, going to conferences, etc.) during their degrees in Biology; the English teachers studied Science until the 9th grade. Qualitative information gathered through (selected questions from) teacher interview is the main corpus of analysis here, and is complemented with data resulting from secondary methods (observation, mainly enabling the context characterization; student questionnaire and interviews, used to support the discussion).

Broadly based on competence areas drawn from the CLIL Teacher's competences Grid (Bertaux et al., 2010), a semi-structured interview guide was developed. The first part contained questions regarding the interviewee's education and work as a teacher, their linguistic/scientific profile, strategies and resources used in classroom practices and socio-cultural implications of the subject they teach, as well as questions linking Science with (foreign) languages (see first part of Research Results). The second group of questions (see second part in Research Results) referred to knowledge and/or experiences they have with the CLIL or CLIL-type approach, at an organizational and educational level. In order to validate the interviewing process and questions themselves, young researchers with teaching experience were interviewed first. With the interviewee's consent, participant teachers were interviewed and audio-recorded at their

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 77, No. 5, 2019

school before the start of the 2015-2016 school year, in their native language (Portuguese) so that they felt comfortable in understanding questions and expressing themselves.

Data Analysis

Qualitative content analysis was performed on verbatim transcribed interviews, forming categories inductively; coding was examined with the project teachers and with peers for validation of the coding (process) and of its coherence with constituted fields, as explained below. For the purpose of this paper, the results associated with participants' points of view on the Science teacher also being a teacher of language(s), relationship between Science and English at school, and the teacher's experience in the planning and implementation of CLIL Science classes, are presented[4] and discussed. Personal information was kept confidential.

In table 1 within the appendix, coded answers given by the project English and Science teachers to the questions indicated in the following sections are shown; relevant examples are provided (referred to in the text by number). The interpretation of this coding also allowed for the classification of the sub-codes in terms of the range of "languages" within Science education (cf. Lemke, 2003; see note n. 2), both in non-project and project classes (with Portuguese and English being spoken, respectively).

Research Results

Representational Forms within Science Education – Non-Project Classes

Forms or modes for the Science representation/communication resulted mainly from answers to *What is your position about the statement "Science teacher is a Language teacher"[5]?* Science was declared to have, as any subject does, a specific lexicon (1a. sub-code in the appendix), which is a language according to both English teachers (Ex.: 1). The teaching of all disciplines including Science must help the students to master their own mother tongue (1b. sub-code), as acknowledged by teachers from both areas (2, 6). This question intentionally did not mention the "English Plus" project, meaning to gauge opinions irrespective of it and its additional language, but the foreign languages (mainly English, 1c. sub-code) being bound to Science education arose as a further aspect. They were considered fundamental to study any course at university by one language teacher (3). The two Science teachers mentioned the intense presence of English in: subject vocabulary; textbooks, online resources and material as well as the learner's search for them; (educational) videos with or without subtitles (8 and 9); news and magazines related to Science; activities (in the lab or through debates) performed using English (because of the project). Science communication was viewed, then, as essential and "embedded" within the nature of Science itself, both in the native and foreign languages (7).

Some of the resources and activities disclosed by the non-language teachers as being in English were introduced as regular scaffolding strategies or learning settings in Science education (1d. sub-code in the appendix) when the interviewer mentioned the term *linguagens*[6] of Science, which better suggested the idea of "Science languages", that is, a diversity of representational choices for conveying Science concepts and processes. Actually, teachers reported, also through answering questions about practices to support and involve learners (such as *Can you talk about examples in the planning and implementation of your classes to make concepts and topics understandable for your students?*), the use of: visual support through videos (8, 9) and concept maps modelling the information through previous personal representations and besides the language (10); simulations and other practical activities; questions and debates (11).

Aimed at exploring through teachers a conceptual/methodological relationship between Science education and English practice in non-project conditions and at extending the understanding of Science languages through the English practice within the EP teaching, the question *What connections can you highlight between the education of Science and the practice of English?* was asked, which was not immediately clear and probably sounded "authoritarian" to the Science teachers because of the mention of the term *didática*[7] (their discourse showed a few

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 77, No. 5, 2019

pauses in answering and they appeared to question the correctness of their own methodological practices). It led one language teacher to identify activities or strategies that English teachers could learn from the example of Science practical lessons (4). One Science colleague thought, on a different level, of the universality of Science teaching across a diversity of languages (12). The language used in/for the discipline (1e. sub-code in the appendix) was, from the English teachers' point of view (5), a concept of language applicable not just to Science. Both Science teachers, more specifically, associated the English language with Science at school and in general, as already emerged from answers to the previous question: the quantity of English terms used in Science (DNA, HIV, etc.) as well as English being the international language used in and for Science (13).

Representational Forms within CLIL Science – Project Classes

In this case, teachers answered questions[8] connected with the CLIL-type approach used in the "English Plus" project and coded responses were organized through fields of the teacher professional practice (in-service education, planning, implementation and assessment). Only the results associated with the planning and implementation of EP classes (Science taught/learnt with English) – especially emerging from the teachers who already worked in a CLIL environment – are presented here.

Regarding the planning level (2a. and 2b. in the appendix), teachers already experienced with the project tended to relate practical aspects, such as the preparation of: the scaffolding for the teacher to know the verbal sequence of the lesson (26) and for the learners in terms of visual or multimodal support (19 and 29), as well as of brand new material (20 and 30). They reported the importance of scheduled meetings to avoid time-consuming email exchanges for designing presentations of the subject topics and checking correctness of the foreign language (21 and 31). The two teachers not familiar with EP hypothesised about teacher teamwork, also to come up with diversified strategies for students (22) and with an adequate educational organization for Science learning through another language (32). The latter aspect was complemented by the experienced English teacher who identified the significant effort required of Science teachers as CLIL teachers (14). They had to learn the scientific English themselves (Ex.: 27), relying for this on the language colleague's collaboration and knowledge, to become familiar with the English version of specific terms, as described by both sides (15, 28). The English teachers, on the other hand, would need to acquire this specific lexicon (16) and to (re)learn some Science concepts, to feel comfortable with the Science content (17, 18).

According to the experienced EP teachers, within the co-taught CLIL-type EP classes (2c. sub-code), the Science and English teachers used to have different specific roles. While the subject teacher implemented Science classes in English, involving students, the language one highlighted terms and concepts in English on the board (23 and 33). The concern about having to use a foreign language was confirmed by the Science teachers who declared, as subject CLIL teachers, that they felt a double responsibility with the pedagogy and education of Science and the language mastery, mainly in terms of speaking and written level (34) and that they were afraid of forgetting how to move forward through the lesson while using another language (35), without a side sheet as said before. Moreover, the need for having the visual support ready and functioning for learners to get to the English word was described, an "assembling" not necessary with the Portuguese mother tongue (36). Finally, the language teacher reinforced the importance of "supplying" students with the Science lexicon in English, images being necessary to support the learning of new terms (24) as much as non-just-written resources to appeal to students (25). The subject teacher actually mentioned how her colleague, during PT classes, used to verify concepts students acquired in EP classes or prepare them with terminology to later use in EP classes (37), using the English language.

Discussion

Teachers do not immediately associate Science with a multiplicity of languages and representation modalities. The Science teachers identified English as the inevitable language used in their discipline in answering different questions [sub-codes: 1c. foreign language; 1e.

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 77, No. 5, 2019

(English) language and (Science) subject, Table 1 in the appendix], whereas the existence of technical terms in Science was, curiously, only reported by the English teachers (specific lexicon in Table 1). Apparently, specific lexicon is not thus recognised as a learning obstacle by non-language teachers but it represents something to learn for non-experts – the language teachers, here, or younger students (Piacentini, Simões, & Vieira, 2016) – in line with the idea that Science language is like a foreign language to learn (Wellington & Osborne, 2001) and "nobody's language", as highlighted by Do Coyle during an event on CLIL[9]. In defiance of these aspects and as argued by these researchers and Sanmartí (2007), the language teachers and one subject teacher acknowledged Science lessons as also being a context for literacy development in the students' mother tongue; in fact, the importance of Science being communicated and becoming available for a wider audience, to be "finished Science", is perceived.

Science relies on words for its communication but also on other semiotic modes such as images, equations, actions, etc. (Klein & Kirkpatrick, 2010; Lemke, 2003; Sanmartí, 2007; Wellington & Osborne, 2001; Tang et al. 2014), as implied by the use of *linguagens* (see Results). One teacher, actually, stated that the mental construction goes beyond languages in the ways Science knowledge is represented (through diagrams, concept maps, models, etc.). Presumably, teachers should reflect on how a graph or diagram conveys and constructs meaning, implying the use of a diversity of signs (terms, arrows, colours, symbols, etc.) whose comprehension, in Portuguese or English, is required for learners to overcome difficulties and understand any subject content (Piacentini et al., 2016). In Lemke's words, students may not "decipher the languages in which we are saying and showing it" (2003, p. 11). To improve learning, teachers need to become aware of and effective with the multiple semiotic systems or languages of Science, as scholars from different fields (CLIL and non-CLIL) diversely advocate (Coyle et al., 2010; Klein & Kirkpatrick, 2010; Lemke, 2003; Llinares, Morton, & Whittaker, 2012; Lyon, Bunch, & Shaw, 2012; Polias, 2006; Wellington & Osborne, 2001).

Until this point, "normal" Science classes have been discussed, that is, classes where the teacher and students use their native language (Portuguese) as the verbal language. However, English is notably present in resources the Science teachers frequently work with, such as educational videos. The presence of subtitles (in the same language as in the video) is considered to improve both the knowledge of the (English) language in terms of oral and written skills, and to support the understanding of a (Science) topic, providing an extra language scaffold to learn through. Also, in agreement with Lin and Lo (2017), a "dialogic way" between the foreign language and the mother tongue, both shifting from colloquial to scientific ways of speaking and vice versa, is relevant. This means that the use of the two linguistic systems should be encouraged in classes within the project but, according to observations, Portuguese was almost forbidden for students or "confined" to the preparation for final exams, while "translanguaging" is desirable and recommended in CLIL (Coyle et al., 2010) and CLIL-like settings (Karlsson, Nygård Larsson, & Jakobsson, 2018). Meyerhöffer and Dreesmann stated that "in its basic form, this [the incorporation of English in the biology classroom] could even refer to acquiring scientific information that is then talked about in students' native language" (2019, p. 16).

The question asked to explore possible connections between Science education and English practice could have seemed less "academic", with the use of "teaching/learning of Science" instead of *Didática das Ciências*. However, the existence of an "educational reciprocity" between Science and English, whether within the CLIL approach or not, is still not acknowledged. Teachers involved in the "English Plus" project did express the transferability of the practical nature of some Science classes to English learning and also the inextricable link between knowledge (both achieved and constructed) development and language development (Klein & Kirkpatrick, 2010; Sanmartí, 2007), but the following question reformulation would have better explored the relationship and reciprocity between Science education and English learning: *How could teachers put Science and English "each in service of the other", in planning and implementing Science classes?*.

It is interesting to highlight that, when engaged in the CLIL methodology through EP (second part in results), teachers seem to assume a different attitude. The Science teachers, who previously had not taken into account (possible learning difficulties connected with) the Science lexicon, realise the language demand in the learning of terminology (Seah & Silver,

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 77, No. 5, 2019

2018), because of themselves experiencing the "linguistic pressure" of teaching in the second language (Oattes et al., 2018), in terms of both communication and scientific terms. Through the challenges encountered using English, they become aware of the need for supporting the understanding with a diversity of languages (visual scaffold but also other modes), in order to facilitate both the learner's meaning making and their own structuring/management of the classroom. Previous studies on the EP students' point of view noted that the subject teacher's difficulties with English enabled her, to some extent, to develop a clear verbal input to express meaning and to adapt teaching strategies to overcome the language obstacle (Piacentini et al., 2018). Here we are reminded by Blanchard, Masserot and Holbrook (2014) that a less distant relationship with students and one more focused on meaning clarification than on the right term can emerge when a language other than the teacher's and learners' native language is present.

In addition, observation of EP and PT classes (see section about research context) revealed what teachers had described, a constant work mainly from the English teacher on both common and Science terms, "labelling, explaining, differentiating and selecting" as illustrated by Seah and Silver (2018, p. 11). The "comprehensibility" of the language makes the specific content more "accessible", promoting the understanding of English and Science (Grandinetti et al., 2013). All project teachers remarked upon the importance of collaboration among colleagues and of combining competences in both the language and non-language subjects. Furthermore, they were observed engaging learners with alternative activities (using online resources, hands-on, debates, song- or game-based, etc.) during CLIL Science classroom practices, as also related by the older students interviewed about EP classes (co-teaching of the specific subject through English) and non-EP classes (non-language teacher, using Portuguese or English). Based on Piacentini, Simões and Vieira (2018), the practice of "a different and effective teaching method (explicit, interactive, not conventional, etc.) is a crucial positive outcome" for the students' learning, permeating even classes given by the subject teacher alone and outside of the project, "beyond just the mere translation" of subject topics into English.

The use of (Science) representational forms other than verbal is not exclusive to project settings, as results demonstrate, nevertheless teachers seem to reflect more on learning problems associated with the understanding of languages and on the importance of multimedia representations and resources, with an additional language. These results are consistent with referential literature. Owing to the presence of a FL, teaching through CLIL makes subject teachers become language-aware (Coyle et al., 2010; Wolff, 2012) and exhibit quality educational strategies (Marsh, 2012), which may improve the learning of both English and Science (Canet Pladevall & Evnitskaya, 2011; Grandinetti et al., 2013). In integrating Science education with English learning, EP teachers asserted the need for and displayed availability and capacity for teamwork, learning from and with each other (Pavón Vázquez & Ellison, 2013), and showed open-mindedness to participating in further educational opportunities with the authors' research group.

However, more effort is fundamental, together with them, to understand, reflect on and put into practice the use of Language during Science classes (Lin & Lo, 2017; Piacentini et al., 2017), with its genres and registers, allowing for the identification and adjustment of teaching practice patterns in this methodological environment, to continue moving toward quality (CLIL) Science planning and implementation and to equip teachers with opportunities for professional development.

Conclusions

Science language(s) is far from just specific terminology, in Portuguese as much as in English; a diversity of functions (classifying, describing, evaluating, etc.) need to be assumed and practiced, in order to "serve" the Science genres and to develop literacy in both the student mother tongue and any additional language. At the same time, teachers agree that Science classes also enable students to become natively literate and on the necessity of Science communication. In their "standard" classes, the Science teachers contemplate semiotic modes other than words – though the impact of languages in them is not fully appreciated – while their teaching of Science with English also entails a greater and more reasoned use of visual scaffold. Speaking this

foreign language during the project, thus, apparently gives the "lenses to the subject teachers" to perceive the language demand, at least of the Science lexicon.

In working within a CLIL-type context such as the "English Plus" project teachers (believe they) can grow professionally, through team working and co-teaching, cross-curricular experience and the development of adequate strategies for the new learning settings. The benefits of CLIL to students are widely acknowledged but, as some authors note, CLIL also means to teachers a different pedagogical "path" that "forces" them to change how they relate with the subject they teach. In an extreme case, one may conclude that the adoption of the CLIL approach with an aware use of the teacher's and students' native language (CMIL, Content and Mother tongue Integrated Learning) might still encourage teachers to revise their practices: within Science education, for instance, teaching in the languages of Science as much as teaching how to use those languages.

Research demands further endeavour to better characterise the intentionality of teachers with regard to the use of Science representational forms, and a more focused observation of how knowledge construction is linked with language progression during both conventional and project Science classes. Nevertheless, the present work contributes to extending research on practice in CLIL Science with English in European countries (macro level). Although it is limited to only a few teachers and their reported practices, it represents a contribution to understanding, in particular, what use or non-use teachers make of language issues and communication modalities to support learners in Science education, and how this can be enhanced through adequate practices when an additional language is "interwoven" with a specific subject. A stronger triangulation of sources and methods and of data gathered at different times will be sought, to pinpoint the influence of an additional language (English, in this case) in the improvement of Science teaching/learning within the CLIL-type EP programme, that might facilitate the learning of Science through English and the practice of English through Science.

Due to the presence of a foreign language and its integration into the specific subject learning, CLIL constitutes a context to understand and review the "weight" given to languages of Science in Science education, as in the case with the "English Plus" project studied by this research, and to orientate classroom practices. Furthermore, it might offer opportunities to investigate "connections" between underpinnings and teaching methods typical of Science with the practice of English vocabulary and discourse structures, to improve the learning of both. Therefore, it may suit the language-focused approach for Science education recommended in literature, to be discussed with and adopted by teachers.

Funding

This work is financed by national funds through the FCT - *Fundação para a Ciência e a Tecnologia*, I.P., under the PhD grant SFRH/BD/102895/2014 and within project UID/CED/00194/2019.

Acknowledgments

The authors are grateful to participating teachers and students. Special thanks are offered to Gareth, the VP's partner, who has been "tutoring" her (PhD) project and her English since the very beginning.

References

Barbero, T. (2006). Insegnare in lingua straniera: quali sfide? Quali difficoltà? [Teaching in a foreign language: what challenges? What difficulties?]. In C. M. Coonan (Ed.), *CLIL: un nuovo ambiente di apprendimento. Sviluppi e riflessioni sull'uso veicolare di una lingua seconda/straniera*. Venezia, settembre 2004 (pp. 105–117). Venezia: Libreria Editrice Cafoscarina.

Beacco, J.-C., Byram, M., Cavalli, M., Coste, D., Cuenat, M. E., Goullier, F., & Panthier, J. (2010). *Guide for the development and implementation of curricula for plurilingual and intercultural education*. Retrieved from http://www.coe.int/t/dg4/linguistic/Publications_en.asp.

Bertaux, P., Coonan, C. M., Frigols-Martín, M. J., & Mehisto, P. (2010). *The CLIL teacher's competences Grid* (CLIL Cascade Network). Retrieved from http://tplusm.net/CLIL_Competences_Grid_31.12.09.pdf.

Blanchard, B., Masserot, V., & Holbrook, J. (2014). The PROFILES project promoting science teaching in a foreign language. *Science Education International, 25*(2), 78–96. Retrieved from http://www.icaseonline.net/sei/june2014/p4.pdf.

Canet Pladevall, R., & Evnitskaya, N. (2011). *Rethink*, *rewrite*, *remake*, or learning to teach science through English. In C. Escobar Urmeneta, N. Evnitskaya, E. Moore, & A. Patiño (Eds.), *AICLE – CLIL – EMILE: Educació plurilingüe. Experiencias, research & polítiques* (pp. 167–177). Bellaterra: Servei de Publicacions de la Universitat Autònoma de Barcelona.

Council of Europe. (2001). *Common European framework of reference for languages: Learning, teaching, assessment (CEFR)*. Retrieved from https://www.coe.int/en/web/common-european-framework-reference-languages.

Coyle, D. (2005). *CLIL Planning tools for Teachers* (University of Nottingham). Retrieved from www.unifg.it/sites/default/files/allegatiparagrafo/20-01-2014/coyle_clil_planningtool_kit.pdf.

Coyle, D. (2013). Listening to learners: An investigation into 'successful learning' across CLIL contexts. *International Journal of Bilingual Education and Bilingualism, 16*(3), 244–266. doi: 10.1080/13670050.2013.777384.

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

Dalton-Puffer, C., & Nikula, T. (2006). Pragmatics of content-based instruction: Teacher and student directives in Finnish and Austrian classrooms. *Applied Linguistics, 27*(2), 241–267. doi: 10.1093/applin/aml007.

Dearden, J. (2014). *English as a medium of instruction – a growing global phenomenon*. Retrieved from https://www.britishcouncil.org/education/ihe/knowledge-centre/english-language-higher-education/report-english-medium-instruction.

Escobar Urmeneta, C., & Evnitskaya, N. (2014). 'Do you know Actimel?' The adaptive nature of dialogic teacher-led discussions in the CLIL science classroom: A case study. *The Language Learning Journal, 42*(2), 165–180. doi: 10.1080/09571736.2014.889507.

Ellison, M. (2018). Net(Working) CLIL in Portugal. *eTEALS, 9*(s1), 4-22. Retrieved from https://ojs.letras.up.pt/index.php/et/article/view/6102.

European Commission. (1995). *White Paper on Education and Training. Teaching and Learning*. Retrieved from https://publications.europa.eu/en/publication-detail/-/publication/d0a8aa7a-5311-4eee-904c-98fa541108d8/language-en.

European Commission. (2006). *Content and Language Integrated Learning (CLIL) at School in Europe*. Retrieved from http://eacea.ec.europa.eu/education/eurydice/all_publications_en.php

European Commission. (2011). *Civil Society Platform on Multilingualism*. Retrieved from https://elen.ngo/wp-content/uploads/2016/05/report-civil-society_en.pdf.

Evnitskaya, N., & Morton, T. (2011). Knowledge construction, meaning-making and interaction in CLIL science classroom communities of practice. *Language and Education, 25*(2), 109–127. doi: 10.1080/09500782.2010.547199.

Gimeno, A., Seiz, R., de Siqueira, J. M., & Martínez, A. (2010). Content and language integrated learning in higher technical education using the *inGenio* online multimedia authoring tool. *Procedia - Social and Behavioral Sciences, 2*(2010), 3170–3174. doi: 10.1016/j.sbspro.2010.03.484.

Grandinetti, M., Langellotti, M., & Ting, Y.-L. T. (2013). How CLIL can provide a pragmatic means to renovate science education – even in a sub-optimally bilingual context. *International Journal of Bilingual Education and Bilingualism, 16*(3), 354–374. doi: 10.1080/13670050.2013.777390.

Holbrook, J., & Rannikmae, M. (2009). The meaning of scientific literacy. *International Journal of Environmental & Science Education, 4*(3), 275–288. Retrieved from http://www.ijese.net/makale/1394.

Jenkins, J. (2015). Repositioning English and multilingualism in English as a Lingua Franca. *Englishes in Practice, 2*(3), 49–85. doi: 10.1515/eip-2015-0003.

Kaire, S. (2017). We are on the same boat, but still I am from another culture: The lived experiences of learning in groups. *Encyclopaideia, 21*(47), 29-48. doi: 10.6092/issn.1825-8670/6946.

Karlsson, A., Nygård Larsson, P., & Jakobsson, A. (2018). Multilingual students' use of translanguaging in science classrooms. *International Journal of Science Education*, 1-21. doi: 10.1080/09500693.2018.1477261.

Klein, P. D., & Kirkpatrick, L. C. (2010). Multimodal literacies in science: Currency, coherence and focus. *Research in Science Education, 40*(1), 87–92. doi: 10.1007/s11165-009-9159-4.

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 77, No. 5, 2019

Lasagabaster, D., & Sierra, J. M. (2010). Immersion and CLIL in English: more differences than similarities. *ELT Journal, 64*(4), 367–375. doi: 10.1093/elt/ccp082

Lemke, J. (2003). *Teaching all the languages of Science: words, symbols, images, and actions*. English version of the paper presented at the conference on Science education in Barcelona, Spain (1998, January). Retrieved from www.jaylemke.com/science-education/.

Lin, A. M. Y., & Lo, Y. Y. (2017). Trans/languaging and the triadic dialogue in content and language integrated learning (CLIL) classrooms. *Language and Education, 31*(1), 26-45. doi: 10.1080/09500782.2016.1230125.

Llinares, A., Morton, T., & Whittaker, R. (2012). *The role of Language in CLIL*. Cambridge: Cambridge University Press.

Lyon, E. G., Bunch, G. C., & Shaw, J. M. (2012). Navigating the language demands of an inquiry-based science performance assessment: Classroom challenges and opportunities for English learners. *Science Education, 96*(4), 631–651. doi: 10.1002/sce.21008.

Marsh, D. (2012). *Content and Language Integrated Learning (CLIL). A development trajectory*. Cordoba: Servicio de Publicaciones de la Universidad de Córdoba.

Marsh, D., Mehisto, P., Wolff, D., & Frigols Martín, M. J. (2011). *European Framework for CLIL Teacher Education*. Graz: ECML.

Martins, I. P. (2014). Políticas públicas e formação de professores em educação CTS [Public policies and teacher education in STS education]. *Uni-Pluri/versidad, 14*(2), 50–62. Retrieved from http://aia-cts.web.ua.pt/artigo.pdf.

Meyer, O., Coyle, D., Halbach, A., Schuck, K., & Ting, T. (2015). A pluriliteracies approach to content and language integrated learning – mapping learner progressions in knowledge construction and meaning-making. *Language, Culture and Curriculum, 28*(1), 41–57. doi: 10.1080/07908318.2014.1000924.

Meyerhöffer, N., & Dreesmann, D. C. (2019). The exclusive language of science? Comparing knowledge gains and motivation in English-bilingual biology lessons between non-selected and preselected classes. *International Journal of Science Education, 41*(1), 1-20. doi: 10.1080/09500693.2018.1529446

Nikula, T., Dalton-Puffer, C., & Llinares, A. (2013). CLIL classroom discourse: Research from Europe. *Journal of Immersion and Content-Based Language, 1*(1), 70–100. doi: 10.1075/jicb.1.1.04nik.

Oattes, H., Oostdam, R., de Graaf, R., & Wilschut, A. (2018). The challenge of balancing content and language: Perceptions of Dutch bilingual education history teachers. *Teaching and Teacher Education, 70*, 165-174. doi: 10.1016/j.tate.2017.11.022.

Pavón Vázquez, V., & Ellison, M. (2013). Examining teacher roles and competences in Content and Language Integrated Learning (CLIL). *Lingvarvm Arena, 4*, 65–78. Retrieved from http://ler.letras.up.pt/uploads/ficheiros/12007.pdf.

Pérez Cañado, M. L. (2016). Are teachers ready for CLIL? Evidence from a European study. *European Journal of Teacher Education, 39*(2), 202–221. doi: 10.1080/02619768.2016.1138104.

Piacentini, V., Simões, A. R., & Vieira, R. M. (2016). Abordagem holística no sistema educativo Português para desenvolver a(s) literacia(s) das ciências integradas com o Inglês [Holistic approach in the Portuguese education system to develop literacies of science integrated with English]. *Indagatio Didactica, 8*(1), 1975–1992. Retrieved from http://revistas.ua.pt/index.php/ID/article/view/3981/3663.

Piacentini, V., Simões, A. R., & Vieira, R. M. (2017). The language focus of Science education integrated with English learning. *Enseñanza de Las Ciencias, Extra*(2017), 399–404. Retrieved from http://ddd.uab.cat/record/184622.

Piacentini, V., Simões, A. R., & Vieira, R. M. (2018). What students tell teachers about practices that integrate subjects with English in a lower secondary school in Portugal. *eTEALS, 9*(s1), 57-76. Retrieved from https://ojs.letras.up.pt/ojs/index.php/et/article/view/6105/0.

Polias, J. (2006). Assessing learning: A language-based approach. *Symposium*, 40–65. Retrieved from www.su.se/polopoly_fs/1.84020.1333710072!/menu/standard/file/2006_3_Polias.pdf.

Roberts, D. A., & Bybee, R. W. (2014). Scientific literacy, science literacy, and science education. In N. G. Lederman & S. K. Abell (Eds.), *Handbook of research on science education. Volume II* (pp. 545–558). New York: Routledge.

Sanmartí, N. (2007). Hablar, leer y escribir para aprender ciencia [Speaking, reading and writing to learn science]. In P. Fernández (Ed.), *La competencia en comunicación lingüística en las áreas del currículo* (pp. 103–128). Madrid: MEC.

Scott, P. H., Mortimer, E. F., & Aguiar, O. G. (2006). The tension between authoritative and dialogic discourse: A fundamental characteristic of meaning making interactions in high school science lessons. *Science Education, 90*(4), 605–631. doi: 10.1002/sce.20131.

Seah, L. H., & Silver, R. E. (2018). Attending to science language demands in multilingual classrooms: A case study. *International Journal of Science Education*, 1-19. doi: 10.1080/09500693.2018.1504177.

Smokotin, V. M., Alekseyenko, A. S., & Petrova, G. I. (2014). The phenomenon of linguistic globalization: English as the Global Lingua Franca (EGLF). *Procedia - Social and Behavioral Sciences, 154*(2014), 509–513. doi: 10.1016/j.sbspro.2014.10.177.

Tang, K.-S., Delgado, C., & Moje, E. B. (2014). An integrative framework for the analysis of multiple and multimodal representations for meaning-making in science education. *Science Education, 98*(2), 305-326. doi: 10.1002/sce.21099.

Wellington, J., & Osborne, J. (2001). *Language and literacy in Science education*. Buckingam/ Philadephia: Open University Press.

Wolff, D. (2012). The European framework for CLIL teacher education. *Synergies Italie,* 8, 105–116. Retrieved from http://gerflint.fr/Base/Italie8/dieter_wolff.pdf.

Yore, L. D., & Treagust, D. F. (2006). Current realities and future possibilities: Language and science literacy-empowering research and informing instruction. *International Journal of Science Education, 28*(2–3), 291–314. doi: 10.1080/09500690500336973.

Endnotes

1 Studies of Science education research are devoted to both "multiple representations" (representing to students the same concept through different forms) and "multimodality" (simultaneous use of different modalities within and across representations). The goal of this paper is not to differentiate them or discuss a "multirepresentational framework" (Tang et al., 2014). Furthermore, multiple media or modes or semiotic systems are equally associated, here, to the adjectives multimedia or multimodal (cf. Lemke).

2 Opportunities for representing and communicating Science concepts and processes, through different languages (cf. Lemke): verbal (spoken and written), visual (graphs, tables, diagrams and drawings), mathematical (formulas, equations, calculations), kinaesthetic (action and observation to make sense within experimental procedures and operations), etc.

3 For further information, www.dge.mec.pt/programa-escolas-bilinguesbilingual-schools-programme

4 Questions asked to participants and their responses, within the results, are typed in italic and have been translated from Portuguese by the researcher.

5 Claimed by Wellington and Osborne (see references), but also by Coyle (a referential author in CLIL research and practice) as a provocation in CLIL events.

6 In English, the differentiation between *línguas* (as in distinct foreign languages) and *linguagens* (as in the language of a particular field) is not possible, as opposed to Latin languages.

7 Though *Didática das Ciências* can be broadly translated as Science education, the Portuguese term is more specifically associated with the idea of teaching methods and practices.

8 *Do you think you have already implemented classes through this approach?*; *What responsibilities does a teacher have as a CLIL teacher?*; *How do you conceive the assessment of modules using CLIL?*; *What needs does a teacher have as a CLIL teacher?*; *Do you think this approach implies extra work?*.

9 https://cetaps.wixsite.com/workingclil1/copy-of-venue

Table 1. Subject representation (representational forms or languages of Science within 1) normal and 2) project classes) through Teacher's coded answers (kinds of languages are associated to each sub-code; examples of quotes are given with reference numbers as used in the main text); EN = English; L = language; PT = Portuguese; SCI = Science; Ss = students; W = word.

1) EN	English teachers
	a. Specific lexicon – verbal language
	1) *SCI also has its own L its own vocabulary […] different from those of EN*
	b. Mother tongue – verbal language
	2) *all teachers must be L teachers, they have to help Ss to master their mother tongue*
	c. Foreign language – verbal language (in general)
	3) *they are fundamental also for Ss of SCI, not just for those of the Humanities*
	d. Activities/Strategies – operational language
	4) *SCIs have a more practical character than EN […] while they do experimental activities in the SCI labs […] we can also do them in the classroom […] recreating situations in which Ss can imagine themselves […] and have to interact using EN in buying something […] other things [practical] like that*
	e. (English) language and (Science) subject – verbal language
	5) *the L as a vehicle of [both] knowledge transmission and learning […] in any discipline*

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Vol. 77, No. 5, 2019

1) SCI — **Science teachers**

a. Specific lexicon – verbal language
NO EVIDENCE

b. Mother tongue – verbal language

6) *a SCI teacher is a communicator as any other teacher, [he/she] must work on the […] mother tongue*
7) *SCI […] exists as communication [in the mother tongue or a foreign L] as well a great researcher might find something […] if he/she doesn't say, it doesn't exist*

c. Foreign language – verbal language (in resources)

7) *SCI […] exists as communication [in the mother tongue or a foreign L] as well a great researcher might find something […] if he/she doesn't say, it doesn't exist*
8) *short videos in EN, I prefer without subtitles […] because they have to pay more attention […], in these EP classes […] when I put them they are in English*
9) *short videos don't always have subtitles so I pause [them] and translate and explain*

d. Activities/Strategies – various semiotic modes (visual, symbolic, verbal, operational)

8) *short videos in EN, I prefer without subtitles […] because they have to pay more attention […], in these EP classes […] when I put them they are in EN*
9) *short videos don't always have subtitles so I pause [them] and translate and explain*
10) *in SCI learning visuals work […] helping a bit to materialise, [otherwise Ss] don't see the process […] images documentaries […] concept maps, [we] obviously [use them] overcoming limitations of our own L […], the representation in terms of mental model […] doesn't have any L has more to do with the experience*
11) *many times [we work on] questions based on the doubts that they had […] they hung labels [with their doubts] like a game*
12) *the question of the diversity of approaches that might be used in the different Ls but […] the universality of SCI regardless of the L*

e. (English) language and (Science) subject – verbal language

13) *EN as an international L that in the SCIs becomes a medium [without which] mobilising and disseminating knowledge is not really feasible*

2) EN — **English teachers**

a. Planning, self-preparation – verbal language (foreign language, terms and concepts)

14) *the SCI colleagues […] have to work on the preparation of the class as well as being correct in the foreign L, [it is] an effort […] which is not natural […] at least at the beginning […], to prepare her class in PT takes x […], in EN y [and] y is much greater than x*
15) *maybe there are concepts [the SCI colleagues] know in PT but not in EN […] they need the EN teacher a lot […] to complement and verify that terms are indeed correct […] they are going to improve their linguistic knowledge with my help*
16) *there is specific vocabulary that obviously I have to master to be able to help my colleagues*
17) *for the EN teacher it is also very demanding [because] he/she has to prepare in the discipline [in order to] feel minimally confident with the content*
18) *as an EN teacher I imagine to learn a series of concepts from the SCI area […] that maybe I learnt when I was younger and I don't remember*

b. Planning, resources/strategies preparation – multimodal/multimedia languages; verbal language (foreign terms); etc.

19) *trying to make a Power Point with images [so that] they […] can get [to the concepts in EN]*
20) *there are not many materials […] we have to create them from scratch*
21) *I'm aware that […] it's a big effort from the directors in terms of organization [but] it's important for us to have at least one hour per week to meet because in previous years we didn't have it and it was emails backwards and forwards*
22) *some [Ss] work better in a certain way […] but others likely in a different way […] working as a team […] we need to find strategies and understand*

c. Implementation (Science teaching in/through a FL) – multimodal/multimedia languages and verbal language (foreign terms)

23) *I'm present in the SCI classes which are given in EN […] it's me in recording on the board so that [the SCI colleagues] feel more at ease […] because one thing is the speaking and another one is writing […] the school direction needs to collaborate in setting the timetable for this to be possible*
24) *I must supply Ss […] with the vocabulary that they don't have [through] a Power Point with images […] and ask them to label […] Planet Earth wind fire mountain volcanoes all these things themselves!*
25) *both in normal and project classes […] the use of appealing materials sometimes even playful to […] catch the Ss' attention […] images visuals […] audios videos […] nowadays Ss are focused a lot on the visual in the life outside [of the classroom] sometimes ignoring everything that is just written*

https://doi.org/10.33225/pec/19.77.636 ISSN 1822-7864 (Print) ISSN 2538-7111 (Online)

2) SCI	Science teachers

a. Planning, self-preparation – visual language and verbal language (foreign language and terms)

26) *[not to] forget what I have to say next [I prepare the sequence] in Word for myself with big letters to know [what] to say to ask them [while projecting a PPT]*
27) *[in order to] find materials I myself must study the scientific L in EN*
28) *obviously I rely on my language colleague's help for some terms […] she makes me feel safe […] I call her my supervisor*

b. Planning, resources/strategies preparation – multimodal/multimedia languages; verbal language (foreign terms); etc.

29) *preparing the material […] adding pictures and then the arrow […] for them to get to the W […] this takes work, the sound animation and structuring all that*
30) *I would really like to have textbooks in EN […] I have to find materials […] to teach [topics in EN] in an interesting way*
31) *this year we've 45 minutes to meet per week but last year […] I used to send my classes to her by email and she would return them with some correction [and] suggestion […] I had to wait to be able to print […] and this was a stress […] it takes a long time*
32) *the coordination between teachers […] to set up an organization that would facilitate the learning of SCI using a L that they do not master that much*

c. Implementation (Science teaching in/through a FL) – multimodal/multimedia languages and verbal language (foreign language)

33) *Ss write on the board the outline […] usually a Power Point shows what they are supposed to record and there is always an explanation […] we're both at the front and she records synonyms in EN so that they can put them next to the meaning […] if they don't know they ask […] like that it's very interactive*
34) *it's a double responsibility […] on the one hand having to organise the pedagogical relationship and the discipline education […] and then the question of mastering the L […] the oral communication […], the written level […] is not that easy […], even the terms […] the pronunciation itself*
35) *sometimes I'm afraid to forget what to say […] there's that W I don't know […] obviously one always feels more stressed than when speaking our own L*
36) *in the presentation with images and the arrow […] I had already written there [the W in EN to show after], they confirmed and felt satisfied […], when electronic resources don't work in EN […] it's worse […] one misses them more […] when it's in PT […] we don't need to show the picture first for them to get the W*
37) *she then reinforces this with Ss [in the project time] through worksheets to see if that soaked in […], sometimes even before I start [a topic] she has already delivered a help sheet about vocabulary*

Received: *August 13, 2019* Accepted: *October 03, 2019*

Valentina Piacentini	PhD Student, Research Centre on Didactics and Technology in the Education of Trainers (CIDTFF), Department of Education and Psychology (DEP), University of Aveiro (UA), Aveiro, Portugal. E-mail: valentina.piacentini@ua.pt
Ana Raquel Simões	Assistant Professor, Research Centre on Didactics and Technology in the Education of Trainers (CIDTFF), Department of Education and Psychology (DEP), University of Aveiro (UA), Aveiro, Portugal. E-mail: anaraquel@ua.pt
Rui Marques Vieira	Assistant Professor with aggregation, Research Centre on Didactics and Technology in the Education of Trainers (CIDTFF), Department of Education and Psychology (DEP), University of Aveiro (UA), Aveiro, Portugal. E-mail: rvieira@ua.pt

Chapter 3: results and considerations

8. Synthesis of Results

Results have been already presented and discussed within each published work. Here, we mean to build up a synthesis of them. Since further analysis has been carried out on complete data, alongside the validation of the category system for both partial and global findings, already published results are integrated with additional ones and with new or updated tables and graphs, through a holistic view into Science education, practice of languages and the CLIL-type EP programme. Published works are recalled, in the text, through the ordinal number used in the conceptual path (section 7). Data sources are indicated in the text, by means of a code (tINTER, teacher interview; sQUEST, current student questionnaire[1]; OBSV, observation; sINTER: former student interview; DOCS, school documents). Questions, words, and statements in Portuguese are typed[2] in italic and following the new *Acordo Ortográfico*. Contrasting statements from the same subject may be found – only in the case of teachers or former students, since current ones were not linked to a code, due to the high number of them – but this is normal when dealing with people. When possible, findings have been triangulated in order to achieve information through a diversity of angles (temporal, spatial, of methods and participants). Participants' voices are preceded by the entry code of transcribed interviews (a number for teachers and a letter for former students; appendices F and G, respectively). For the readability of the section, indentation will be used for quotes or group of quotes being longer than 65 words. At the end of this section, main evidence emerged from different sources and present in the following results or in previous sections (participants' profile in methods, 5.3, and context characterisation, 6.2) is overviewed in Tab. 12.

8.1 Science and Science education

Next parts provide facets of Science (in 8.1.1 and 8.1.2) resulting from EP participants, practice observation (in and out of class) and document reading.

8.1.1 Science (learning): contexts, attitudes and difficulties

Contexts. Within the *Projeto Educativo da Escola* 2014-2017 (DOCS), besides the EP of Science (described in the first chapter and published works), school projects connected with Science and involving students beyond the curricular timetable were: *Par a Par com a Saúde PASSE PRESSE* (promotion of healthy life styles, personal and social competences and sex education at school for

[1] For the purpose of this section, answers used as significant examples, here, have been proofread.
[2] Convention used to transcribe interviews (see appendix E) was not applied here.

the prevention of risk behaviours); *Eco-Escolas* (raising awareness about the importance of individual behaviours for the environment and sustainability as well as practice of recycling, reduction and reuse at school); *Fundação Ilídio Pinho – Ciência na Escola* (integration of the scientific, industrial and entrepreneurial areas and promotion of Science and Technology).

Notwithstanding the fact that the goal of one question to current learners (sQUEST: n. 6) was to identify contexts where they experienced Science together with English in their daily lives (*Apresenta um exemplo do teu dia a dia, fora da escola, em que já "encontraste" as Ciências ligadas ao Inglês*), data gathered through it[3] gave us information also about contexts to "contact" Science out of school, as shown in Tab. 4 (updated version of the already published one).

Table 4: coded answers to question n. 6; occurrences of students' quotes are shown in brackets; absolute frequency for each category is also provided.

CATEGORY	Contexts to experience Science with English (q6)	TOT
A) Information media	a. television (32) b. printed material (7) c. Internet (3)	42
B) Visits and tours	a. Science museums (6) b. natural parks or zoos (5) c. visits in general (4)	15
C) Other contexts	a. commercial contexts (10) b. school-related topics (6)	16

"English embedded in Science" learning spaces[4] have been already presented (cf. work IV). Furthermore, some contexts emerged as providing a contact with other languages more than others (such as music and television, for which, on average, almost one language beyond Portuguese and English was identified) and were indicated as "integrative" reasons for which

[3] Almost 20% of answers were unclear either for the context experienced itself not being clear (*já encontrei as Ciências ligadas ao Inglês pois muitos processos em Ciências têm nomes ingleses*) or for the connection between Science and English being unclear (*acho que está tudo um pouco ligado às Ciências. Tal como a matemática, a Ciência está sempre no nosso dia a dia*). More than half of this group of answers were presumably Science topics students learned at school in English.

[4] A) documentaries on Science topics broadcasted on channels such as National Geographic or Discovery Channel, but also through (scientific and not translated) movies, commercials and news available on television (on foreigner or international channels, for example); B) visits during which information in English could be found or English is used as a mean of communication with people speaking different languages, as well as visits taking part in trips abroad or within school projects such as the "English Plus"; C) purchase of commercial products and medicines, and involvement of the student's spare time and families, but also mention of homework and the project.

students were motivated towards English (cf. work II[5]), and could motivate towards Science as well. The use of a rap song was, in fact, observed during EP Science classes along with a widespread enthusiasm for learning about plate tectonics while singing (OBSV). Moreover, students's quotes disclosed a role of English in this area: *em alguns sites, enquanto fazia algumas pesquisas [de Ciências, encontrava o Inglês]*; *em casa quando vejo os programas ingleses e americanos na televisão [...] sobre a Ciência encontro palavras que aprendi na escola*; *em documentários na televisão em Inglês nos canais sobre Ciências*.

This and the "practice" of conflating English merely with English speaking countries (tINTER, OBSV and DOCS) may have led to the sentence *na televisão vejo que praticamente todos os cientistas são ingleses*. On the other hand, Sci-new's perspective was that English could "broaden" Science in these learners' eyes, as exposed in 8.2.2. After all, *o projeto pretende preparar os alunos para as exigências da sociedade atual, em que os contactos internacionais, quer no mundo académico, quer no mundo de trabalho, são cada vez mais frequentes, reconhecendo a importância da Língua Inglesa como instrumento privilegiado de comunicação* (DOCS).

Attitudes. When current students had to choose their nickname within the "English Plus" project (sQUEST: n. 1), most answers (almost 85%) had to do with Science fields, Astronomy (not covered by the 7th and 8th grades' Science syllabi) and Petrology (part of the first year curriculum at lower secondary school) being the most reported ones. Science-related nicknames showed a sort of bond with the subject, for instance: *Kika the Scientist*, *flood*, *eukariotic girl*, *atom*, *Thunder Kid*, *cell-men*, *Penguin_on_ice*, etc., whereas *Dr. Lou*, *Rockstar*, *Smaragad*, *Unicorn* or *Engenhocas* were some of the non-science examples. In basically all types, students opted for using a noun by itself (animal, material, plant, etc.) or together with a title (Miss, Dr., Sir, etc.). Some cases of adjective plus noun existed, even combining the English and Portuguese languages (*Geospheric xico*), and only *Redstone Active* and *Volcano Bya* presented grammatical mistakes.

In terms of the curricular subjects identified as favourite ones by students attending the EP project in the year of our study (sQUEST: n. 5), Mathematics was the strongest favourite discipline, but it was an average one in terms of second and third choices (data not shown); English was often one of the preferences, even if they could have another subject they liked more; Physical Education was another generally popular subject; after that, Geography, Physics-Chemistry and History were reasonably popular. To visualise these results, we summed the scores

[5] In the book chapter, the fact that these young people have equal or higher contact with English than with Portuguese for the contexts of television and music, respectively, was not made sufficiently explicit.

(when chosen as the first, second or third choice) for each subject and plotted in a horizontal numbered bar (Fig. 4).

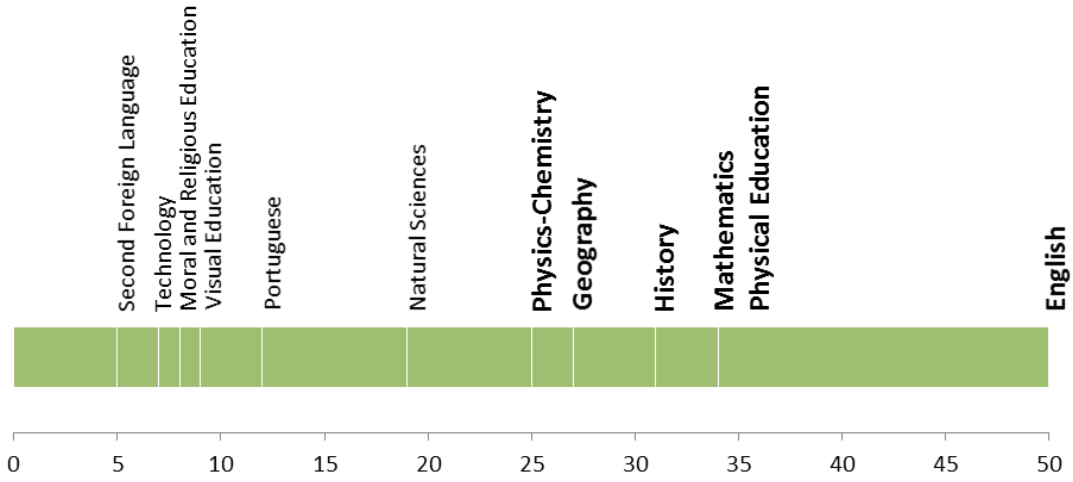


Figure 4: favourite subjects (absolute frequency); total equals 87.

It is worth remarking the poor presence of the other language subject areas: just 12 points for the mother tongue Portuguese[6] and 5 for the foreign language French. On the other hand, the preference for Physical Education and Mathematics (the learner preferences normally diverge when dealing with these two disciplines) equaled 34, for History 31 and Geography 27. Natural Sciences and Physics-Chemistry were moderately chosen (19 and 25 points), and even less by 7th graders (5 and 6, respectively, as opposed to 14 and 19 from the older group). Among the whole group of previous EP students, 14 out of 26 followed Science at high school.

These last students' choice to continue studying Science required self-confidence and motivation, increased through the EP project (even though it was attended in History), its activities and challenges:

> fsSci_7, d., *como estudante me permitiu ver melhor as coisas, permitiu ir para vários locais […] acontecimentos [e] gostar mais desta área de Ciências […] foi um projeto que nos incentivou sempre a melhorar as nossas capacidades, portanto quando chegámos a escolher, é fácil nós passarmos para Ciências […] se calhar tal como fomos por exemplo neste projeto, que era o mais difícil naquele momento para nós e conseguimos ultrapassá-lo, também incentivou-nos a ir para as Ciências […] naquela altura a escolha mais difícil que podíamos fazer*.

A similar confident idea about Science was also expressed by current learners (*o curso de Ciências é o mais difícil, ou seja, também é o melhor, ou seja, quando precisarmos de um emprego e*

[6] Portuguese was indicated, through answers to question n. 7 (*Língua(s) aprendida(s) na escola*), among the languages learnt at school (together with English and French) by almost 60% of students. Thus, they acknowledged their mother tongue also as one language to learn formally.

termos no nosso currículo que estivemos na universidade de Ciências, vão deduzir que somos bastantes espertos).

In order to present attitudes with Science of these young students (cf. work IV) and improve how they were organised[7], Tab. 5 integrates coded answers to questions about "Importance of Science learning" and "Positive aspects of Science" (sQUEST: n. 12, *[é] importante aprender Ciências porque* … and n. 11, *[…] o que mais gosto das Ciências é …*).

Table 5: coded answers to questions n. 12 and 11; occurrences of students' quotes are shown in brackets; absolute frequency for each category is also provided.

CATEGORY	Importance of SCI learning (q12)	TOT	Positive aspects of SCI (q11)	TOT
A) Knowledge construction	a. understanding of the natural *milieu* (42) b. broader/richer knowledge (8)	50	a. understanding of the natural *milieu* (20) c. Science curriculum (33)	53
B) Knowledge applicability	a. Science's holistic presence (5) b. everyday use (7) c. one's general future (14)	26	a. Science's holistic presence (7) d. specific use (14)	21
C) Professional or academic future	a. working with Science (12) b. Science studies (7)	19	NO EVIDENCE	0

The understanding of the natural *milieu* constituted the main factor of the importance of the learning of Science and a relevant aspect for which students appreciated Science (*conhecer o mundo em que vivemos de uma forma mais complexa*; *assim sabemos (quase) tudo o que se passa à nossa volta*; *temos que saber de que são feitas as coisas naturais que nos rodeiam*; *saber o porquê de algumas coisas acontecerem na natureza e a origem delas*; *para percebermos também como o nosso corpo e o nosso psicológico funcionam*). Despite students were asked what they liked about Science in their everyday lives, around 40% of answers related aspects of Science at school: topics, lessons and activities as well as its study/logics (*Biologia, Geologia, …*; *o seu estudo e as suas teorias*; *as suas experiências, a sua lógica e resumindo, gosto do que é a Ciência*).

In addition, Science learning was considered important for the use in daily life, B)b, also in the future, B)c, as shown in Tab. 4. Compared to foreign language learning (cf. work II), "pragmatically" addressed to emigration and the working sphere, the "Science's holistic presence" factor arose (*o facto de que podemos passar em qualquer lugar, observando plantas, rochas, ... e é tudo Ciências*; *a Ciência fala de várias matérias diferentes e ajuda em tudo*; *o facto*

[7] Categorisation became more solid over time (see 5.4.4.2), also through the analysis and validation of data connected with the learning of foreign languages.

de em praticamente todas as disciplinas terem uma parte de Ciências; *há regras e coisas básicas que se aprendem nesta disciplina para o nosso dia a dia*). Science knowledge was also reported, in B)d, through specific examples of its application (*quando estou a andar na rua consigo identificar os animais ou plantas que vejo e consigo identificar vários fenómenos naturais*; *o facto de quando estou doente, saber o que devo fazer, como devo reagir, o que me levou a ficar assim*). Since learners appeared, here, aware of and competent with its use, we opted for differentiating this code from B)b (general use).

Owing to the concrete references to future jobs (*se nós quisermos ser médicos ou engenheiros necessitamos de Biologia ou Ciências*; *se quisermos ser geologistas, cientistas, etc. temos que aprender Ciências e isso toda a gente sabe*) and academic choices (*se quisermos seguir um curso, temos de saber um pouco de tudo e acho que em todos os cursos as Ciências são importantes*; *neste momento não sei o que quero ser quando for grande e Ciências pode estar incluído no curso*), all in the Science field, these factors of importance were counted in a separate category. A similar situation was not found among the FL importance, cf. work II.

In relation to the two language teachers participant in this "English Plus" project of Natural Sciences, answers (tINTER: n. 2, *Pode descrever a sua experiência de aprendizagem escolar em Ciências? Como pensa que utiliza estes conhecimentos no seu dia a dia?* and 6, *Qual é o papel que atribui [...] ao manusear na aprendizagem do Inglês na escola?*) revealed that they studied Science until the 9th grade, with Eng-new having experienced a beneficial learning based on practical works and applicable every day (8, *nas Ciências tínhamos aulas teóricas e aulas de laboratório […] fazíamos experiências […] todos em grupo com a professora a proporcionar-nos aprendizagens e nós a executarmos [aulas] de caráter prático […] depois [foi] para* a *área das Letras [e] aquela parte experimental deixou de existir […] conhecimentos que eu tive na escola [uso] no nosso quotidiano*). On the other side, Eng-old recalled lectures of Science (22, *na altura em que eu estava a estudar não havia tanto enfoque no trabalho experimental laboratorial, [eram] aulas mais expositivas*), a "normativeness" enduring in her conception on this discipline and attitude with it, as observed in planning sessions (OBSV).

The latter conceived the presence of hands-on activities as typical of Science education (48, *nas aulas de Ciências vejo um papel mais importante […] no mexer do que propriamente nas minhas […] quando trazer um mapa ou panfletos e passo pela sala para que cada um veja mas não é algo que faça com muita frequência*), but items she mentioned acquired an intentional connotation through her colleague Eng-new (36, *às vezes mediante os temas levo […] realia […] material autêntico […] jornais revistas panfletos, se estamos a dar a parte de alimentação dos restaurantes,*

se tenho levo-lhes menus para eles perceberem […] em Inglaterra se forem lá o que vão encontrar), who also declared that some Science practice can be positively transferred to English classes (cf. voice 4 in the appendix of work V).

Difficulties. Moving to aspects (strategies, activities, resources, etc.) typical of Science education and that could represent obstacles to the learning of Science in the experience of current students (sQUEST: n. 13, *Como descreves as tuas dificuldade(s) na aprendizagem das Ciências?*), a frequency of difficulty (5 points in ascending order of difficulty + 1 for "not understood") was attributed in relation to a given list of those aspects (cf. work IV). Percentages relative to each point of difficulty were calculated[8], for each group of students (7th and 8th graders). Concentrating our attention on the more well represented degrees of difficulty (when percent value for each point was greater than 1%), we summed percentages of only answers indicating actual difficulty ("neither seldom nor often" and "almost always" points, as translated from those in the questionnaire), for the two groups. Therefore, Fig. 5 offers a more simplified layout than the ones in the above-mentioned paper.

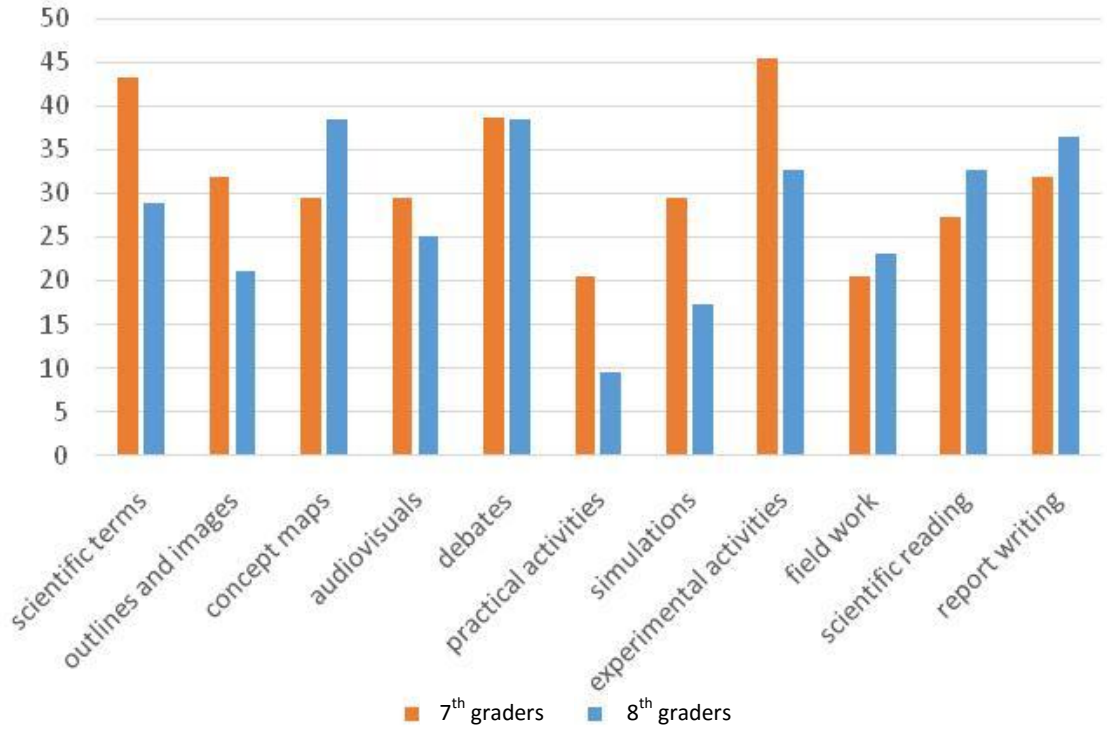


Figure 5: 7th and 8th graders' difficulties (percent values on the vertical axis) in aspects of Science education (summarised and translated from those in the questionnaire).

[8] The multiplication between the number of students in the two grades (44 at 7th and 52 at 8th) and the number of aspects (11) resulted in 484 (7th graders) and 572 (8th graders), totals used in ratio with the total number of answers per point [(1)-(5)] across all the aspects x 100.

Construction of concept maps, participation in debates and writing of reports was acknowledged as most often difficult by 8th grade students. These processes or activities actually require learners to have acquired knowledge and to use the language (oral argumentation in the second case and written organisation in the third one, and a synthesis ability for constructing concepts), in contrast to simulations and practical activities or other ones implying just visualisation and other types of skills. In terms of visuals, from observing Science single-taught classes, the use of diagrams (the nitrogen or water cycles, for instance, during lessons of Ecology) without description or explanation of its components (arrows, colours, images, equations, etc.) emerged (OBSV).

With regards to the 7th graders' significant difficulties, the pattern was generally similar, however they also reported much more frequent difficulties with experimental activities, such as those simulating the lava flow through variables observed during Natural Science classes at the laboratory (OBSV), representing, since questioning and argumentation skills were necessary, linguistically demanding scientific contexts. The understanding of scientific terminology was also found more difficult, when compared with the situation of previous students. It is worth adding the class episode (OBSV) of when the term *cisalhamento* was used in the study of the Earth, which was "opaque" even in the Portuguese mother tongue, and would have needed for a verbal "mediation" (*deformação de rochas decorrente do deslizamento de placas tectónicas em sentidos opostos*) and visual support (an adequate image or animation). In relation to aspects found not particularly difficult, again, the practical character of some work, inside and outside of the school, could have made these activities more "accessible" for learners.

Moreover, observation of sessions for the planning of Science classes showed that the 7th Science curriculum (primarily, Geosciences) was considered, among teachers, more adequate for the Science education of later grades than right at the start of a new school cycle (OBSV).

8.1.2 Practices of Science education for teachers and students

According to teachers. While Eng-new and Eng-old were asked about English (classes), plurilingualism and cultural dimension (cf. work II), the question for the two Science teachers was about construction of Science knowledge and role of experimentation in Science education (tINTER: n. 6, *De que maneira descreveria o papel da manipulação e experimentação […] na aprendizagem das Ciências na escola?*, 7, *Concorda com a ideia que o conhecimento científico se constrói?* and 8, *Como pensa que nas aulas de Ciências se possa aprofundar uma(s) cultura(s)?*).

According to Sci-new, Science knowledge emerges from a process of construction and communication (16, *o facto da Ciência evoluir, também tem muito a ver com esta grande capacidade que nós temos hoje em dia de comunicar a Ciência que se faz, [que] deixa de ser uma*

ideia do cientista e passa a ser uma ideia do mundo […] depois a partir de uma investigação há muitas universidades que fazem logo centenas de investigações), which could be adapted to Science learning, as long as the students' problem posing and conceptual change is promoted (20, *é um processo construtivo mas adaptado […] é uma construção individual […] pela capacidade que temos de com eles problematizar […] depois […] os esquemas mentais vão-se adaptando e readaptando*). Nevertheless, the "constructivist" perspective of learning by discovery and through actual experimental works has been replaced by the goal of the test score (20, *nós tínhamos uma perspetiva mais construtivista […] de Ciências pela descoberta, pela problematização, [agora a] grande preocupação ao nível do ensino secundário é exatamente que eles fiquem com um corpo de conhecimentos […] para puderem enfrentar […] nomeadamente os exames […] ou mesmo as metas […] o modelo que eu trazia atrás era muito de aulas laboratoriais*), which might have restricted the organisation/possibility of activities of this kind (OBSV).

Teachers highlighted the importance of experimentation, and described examples of activities and the obstacles to their preparation or feasibility:

> Sci-new, 22, *a experimentação tem um papel extremamente importante [para] os próprios alunos terem a perceção daquilo que se faz enquanto construção científica [mas] neste momento está muito deprimida [nas] nossas escolas […] um meio facilitador é o facto de haver a divisão em turnos [mas no básico] 45 minutos acho muito pouco tempo […] uma coisa é uma aula laboratorial simples, outra coisa é um trabalho experimental que requer elaboração de hipóteses […] isso é que é verdadeira construção […] uma coisa é uma demonstração que nós fazemos muito, mas […] acaba por ser mais expositiva […] em termos da aprendizagem*;
>
> Sci-old, 78-82+58, *fazer uma aula prática [por exemplo] a couve roxa é um indicador biológico [se] eu já o trago cozido de casa […] não tem piada [assim como] eles têm que mexer com o microscópio […] em grupos pequenos […] mas eu tenho que estar em cima dos grupos [e] é preciso de tempo para […] todos verem […] nós dantes tínhamos os 90 desdobrados […] podíamos fazer quando […] fosse a altura própria […] fiz as dobras e as falhas com plasticina [mas agora] não consigo pôr uma turma inteira de 28 a trabalhar com plasticina e com conchas a fazer moldes e contramoldes*.

Sci-old also shared her experience associated with giving sex education, during which students used to ask *questões incríveis*. They, actually, seemed to make sense to life through Science classes (96, *eu acho que quando têm dúvidas sobre seja o que for, é sempre para a aula de Ciências. Porque eles acham que é em Ciências que se tem que responder a tudo mesmo que não tenha a ver*), with the teacher learning herself (98-100, *se eu […] não sei hoje […] vou pesquisar e digo amanhã ou até tenho aqui a net, vamos já ver isso […] os próprios cientistas têm questões às quais não sabem dar resposta […] mesmo as respostas são muito divergentes […] os alunos […] pensam naquilo que não nos passou pela cabeça e nós aprendemos com eles […] todos os dias*). In

her opinion, Science knowledge is thus constructed all the time, not just during classes but also outside the school walls, through the everyday experience.

Regarding the question about culture(s) and Science classes, Sci-new stated that students feel that their "culture" is not represented at school, although some issues of the (former) Science programme may be explored to understand local resources and traditions (46, *dá por vezes […] integrar elementos […] locais e regionais […] lembro-me de um trabalho que fizemos há muitos anos […] sobre o ciclo da água e depois vimos a questão dos recursos hídricos locais e a questão da cultura ligada à água […] das cascatas pelos santos populares*) and related to those of other cultures (48, *fomos buscar essa tradição […] em que o elemento da ligação era a água […] daria para eventualmente ir buscar como é que outra cultura vê a tradição dos santos ou da água […] em termos das Ciências [com as paisagens, porque este programa é só rochas] como por exemplo as diversas culturas preservam os geomonumentos*).

Her colleague Sci-old, on another way of thinking, interpreted "cultures" as values and attitudes that students develop at home and emerging in classroom within certain topics (106, *eles têm regras que são as de lá de casa […] fiz grupos de rapazes e grupos de raparigas para cada grupo dizer o que achava dos outros*), some of which students have a need for talking about and understanding (110, *eu costumo tocar muitos pontos porque geralmente vou ao encontro de aquilo que eles perguntam […] Educação Sexual […] a maior parte dos miúdos não se abre em casa porque, ou perguntam aos pais e os pais não sabem como responder […] ou então os pais acham que se perguntam é que já andam nessa vida*). Cultural aspects referred to in both cases added insight beyond the usual mention of Halloween or Christmas (cf. work II) and are crucial features to consider with students.

According to students. Declarations of the ex-EP learners – who had previously had "English Plus" of History in 2010-2013 and later attended a scientific field in high school – in terms of possible ease with the learning of Science (Biology, Chemistry, Physics, Geology and, to some extent, Economics or Geography) thanks to the EP experience (sINTER: n. 8, *Consideras que o projeto trouxe algumas facilidades no estudo das disciplinas científicas? Se sim, como?*), allowed us for gaining information connected with Science education.

Needless to say, the access to and understanding of information useful for scientific studies was facilitated by English language skills and the search for online resources (fsSci_3, d., *no secundário […] a professora de Biologia dava-nos muitos vídeos em Inglês, [ao] ver um simples vídeo em Inglês […] já conseguia retirar alguma informação de lá*) as well as papers (fsSci_6, d., *muitos dos artigos que nós usamos às vezes para fazer trabalhos e mesmo para estudar estão em Inglês*,

[com] o projeto [temos] mais facilidade a compreender aquilo que precisamos de saber). As seen among younger learners in the previous section, Science learning envisaged the understanding of terms (more or less specific), which could be supported by knowing English (fsSci_3, d., *nas Ciências em si [existe] um outro vocabulário que nós aprendíamos*; fsEcn_4, *em Economia nós temos […] leasing e franchising […] não existe tradução em Português*; fsSci_1, d., *nós aprendemos [ao longo do projeto] muitas [palavras] que podem ser aplicadas também em Ciências*).

The study of Science in secondary school levels was facilitated by having had a different learning experience and having learnt a method of study within the EP project,

> fsSci_2, d., *fazíamos coisas diferentes e éramos obrigados muitas vezes a dar asas à nossa imaginação […] por exemplo […] uma peça de teatro […] que nós adaptámos […] também nos deixou com o à vontade perante as outras pessoas e […] melhorou a nossa capacidade oratória, [no] secundário […] nós temos que fazer apresentações orais […] mesmo que seja em Português porque o à vontade nasce também deste tipo de situações [também aprendemos] muita metodologia […] muitos métodos mesmo de estudo, [por exemplo] no início do ano eram-nos dados sempre umas folhinhas para nós pormos o estudo todo organizado*;
>
> fsEcn_8, d., *o projeto ajudou-me muito […] em atividades […] no secundário […] a aprender a fazer debates, a pesquisar […] aquelas atividades todas fizeram-nos aprender muito melhor aquilo que tínhamos que aprender, tanto em História como em Inglês […] ou até em Geografia […] não era aquilo decorar que […] vomitamos no teste entre aspas e acabou […] lá fazíamos [também] através de teatros, são coisas que acabam por ficar*,

all this helping in the future because, as clarified by fsSci_2, *o método acaba por ser quase independente da língua, o método está dentro de nós entre aspas*. Participation in debates or plays was important for oral skills and was observed also during the study in 2015-2016 (OBSV).

Hence, an engaging school environment favours the learning of specific subjects, as shown by one of our articles (cf. work III) and reinforced in the next section. The fruitful case of Science has just been presented here. Furthermore, students who attended the "English Plus" of Science in the year of our inquiry were asked to provide suggestions to their Science and English teachers for improving learning (sQUEST: n. 14/15, *Indica a(s) sugestão(ões) que gostarias de dar à professora para poderes aprender melhor Ciências/Inglês*)[9]. An updated version (providing codes for each category and focused on Science teaching within convetional settings) of the overview of categorised answers (cf. work IV) follows in Tab. 6.

[9] A remarkable percentage of students declared to be satisfied or did not provide any specific suggestion, especially in the case of the English teaching (19% and 27% for the 7th and 8th Science teachers; 44% and 51% for the English teacher of 7th and 8th graders).

Table 6: percent values of student answers (Sci-new, 7th graders' teacher; Sci-old, 8th graders' one) for relevant categories; words under percentages give the most represented suggestion for each category.

TEACHER / SUGGESTION	Sci-new	Sci-old
A) Subject representation a. audiovisuals b. outlines c. presentations d. worksheets	30% outlines	16% audiovisuals
B) Science activities/strategies a. practical work b. field work	27% practical and field work	55% practical work
C) Posture in class a. clarity b. dynamicity	15% dynamicity	25% clarity

Suggestions for the subject representation were not elaborate, the coding denomination easily giving an idea of this kind of learning needs: a. to watch movies, videos or animations; b. to draw tables or to schematise or to recall previous topics; c. to present the subject through Power Points facilitating the learning; d. to fill in worksheets or to do exercises in order to reinforce any topic previously taught/learnt.

As for posture in class, one statement coded as "clarity" for the 7th grade Science teacher (*ser mais calma nas suas explicações porque há alguns conceitos que não são muito abordados nas aulas e a professora dá como dado*) is worth noticing, even though it could be due to her having little familiarisation with lower secondary school levels, as she herself declared many times during the interview (tINTER) and planning sessions (OBSV). The "dynamicity"-coded quotes offered various suggestions (*falar com mais expressividade*; *as aulas devem ser interativas e divertidas* also with *mais jogos e atividades*; *as professoras deviam dar mais motivação aos alunos* or *colocar-se no nosso lugar durante a aula e ser-lhes feitas também algumas questões*) for the two Science teachers. Sci-new and Sci-old were actually observed having different "classroom" styles (in terms of prosody, gestures or move(ment)s through the space, use of resources)[10] in classroom as well as during the planning of or reflecting on lessons (OBSV). The observation of bare walls – with consequent lack of visuals to scaffold the learning – in all classrooms is also relevant.

[10] For further details, see the "teacher scaffolding strategies" (E. and F.) of the observation instrument (cf. Piacentini, Simões, & Vieira, 2017).

Younger current EP students suggested to their Science teacher to increase practical and field work (*devíamos fazer várias atividades práticas pois é mais fácil aprender porque estamos a ver o que acontece e percebemos melhor*; *fazer mais saídas de campo para perceber a matéria na prática ajudando a aprender a parte teórica*) but, primarily, a higher use of sketches, tables and summaries to organise and communicate the subject, which entails the visualisation of the information related to the specific topic to support the structuring and understanding of knowledge. More than half of older current EP students, instead, related a lack of practical activities typical of the laboratory-like environment. A poor diversification of strategies and material was observed also within theoretical classes, probably because of the specific topics of the Natural Sciences 8th grade syllabus (ecosystems and resources) (OBSV).

Forms or modes for the Science representation/communication (words, images, graphs, equations, actions, etc. to be considered as "Science languages", cf. note n. 16 of Chapter 1) resulting from teachers' conceptions (tINTER: questions[11]) on the non-CLIL practice, that is, irrespective of the "English Plus" project and its additional language (cf. "representational forms within Science education – non-project classes" and corresponding voices in the appendix of work V), are organised in Tab. 7.

[11] n. 3, *Pode explicar a sua posição/opinião em relação à afirmação "o professor de Ciências è um professor de língua(s)"?*; n. 4, *Pode falar sobre alguns exemplos na planificação e implementação das suas aulas que lhe permitem tornar conceitos e temas científicos/curriculares compreensíveis para os seus alunos?;* n. 9, *Que ligações pode destacar entre a didática das Ciências e a prática do Inglês?*.

Table 7: subject representation and languages within regular classes through teachers' coded answers; differences between Science and English teachers are underlined and described in the text.

Science representation within non-CLIL practice (1)	**English teachers**
	a. specific lexicon – verbal language (Eng-new, Eng-old) b. mother tongue – verbal language (Eng-new, Eng-old) c. foreign language – verbal language, in general (Eng-new) d. activities/strategies – operational language (Eng-new) e. (English) language and (Science) subject – verbal language (Eng-old)
	Science teachers
	a. NO EVIDENCE b. mother tongue – verbal language (Sci-new) c. foreign language – verbal language, in resources (Sci-new, Sci-old) d. activities/strategies – various semiotic modes: verbal, visual, symbolic, operational (Sci-new, Sci-old) e. (English) language and (Science) subject – verbal language (Sci-new, Sci-old)

To put it briefly, scientific lexicon was acknowledged as a language by the English teachers but not by the Science ones. The teaching of all disciplines including Science must help students to master their own mother tongue (b. code), as indorsed by teachers from both areas. English was referred to by language teachers in general terms, whereas their subject colleagues mentioned its presence in online resources, videos (with or without subtitles[12]), magazines, etc. connected with Science (education). The latter introduced some of these also as scaffolding strategies or learning settings recurrent in Science education (visual support, concept maps, practical activities, etc.). The relationship between the language and learning the discipline through it (e. code) was, from one English teacher's point of view, a concept of language applicable not just to Science. Both Science teachers, more specifically, associated the English language with Science at school and in general, as said before: the quantity of English terms used in Science (DNA, HIV, etc.) as well as English being the international language used in and for Science.

Preliminary findings achieved during the study (some of the student suggestions and observed practices examined above) revealed the presence of "Language use in/and Science learning in interaction" that materialised in the corresponding instrument (cf. different contributions, grounded in referential literature and frameworks, of work I), where "Science languages" were included (mainly as genres, B., and resources, F.) and extended (through purposes, A., and verbal

[12] The correct position of voice 8 in the paper/table is 2) SCI instead of 1) SCI, in other words, it was related by Sci-old as a practice within the EP project.

strategies and other practices, E.). No relevant evidence for the use of languages appeared from scanning the Sci-old's 7th grade Science plan[13].

8.2 Science education and CLIL practice

Next parts illustrate the presence of English within the project (8.2.1), advantages and difficulties of learning through CLIL as seen by EP actors (8.2.2) and emergent visions of Integrated Learning (8.2.3).

8.2.1 English presence within the specific subject teaching/learning

Languages within integration. In the case of the planning and implementation within CLIL Science practice (EP project settings) declared by teachers (tINTER: questions[14]), Tab. 8[15] shows previous findings (cf. voices in appendix as "representational forms within project classes" in work V) and updates them, adding about teacher education (short unequivocal sentences generating the d. code) and student assessment (see below). For sustaining "Science with English" classes, language teachers had to become acquainted not just with the English version of Portuguese scientific terms (16) but also with the concepts of Science regardless of the language (17 and 18). Both the English and Science teachers related the need for organising presentations with text, images and more, as well as worksheets to support students (25, 29, 36, 37). On the other hand, the non-language teachers had to be able to prepare (14, 26) and implement (34 and 35) Science classes speaking the foreign language, besides the knowledge of scientific terms in English (27).

The concern of having Science lexicon translated into English was actually observed within practices of planning and in classroom (OBSV), for single technical words (*dobras*, *falhas*, *forças distensivas*, *plano inclinado*, etc. from the 7th Science syllabus) but also for whole body systems (such as the digestive one) or complex health topics, with the two Science teachers constantly relying on Eng-old for that. She used to resort to both textbooks for English native learners and online search, sometimes feeling not prepared and overwhelmed (*eu não me sinto à vontade nas*

[13] This document was chosen because Sci-old already had some experience with the project of Science and English, made all her plans available to the researcher and pointed out that she had changed the order of the 7th grade topics to help students to understand. Further analysis of the Science curriculum is required.

[14] n. 10 (CLIL knowledge and experience, *Pode partilhar o que sabe sobre o CLIL [...], a abordagem do projeto English Plus? Acha que já tem implementado aulas ou parte delas através desta abordagem?*), 11 (responsibilities in teaching through CLIL, *Quais são as responsabilidades, na planificação e implementação, que considera que um professor tem como professor CLIL?*), 13 (student assessment within CLIL, *Como equaciona a avaliação de módulos realizados em ambiente CLIL?*), 14 (needs in terms of school organisation and professional education, *Quais são as necessidades, ao nível de organização e formação, que considera que um professor tem como professor CLIL?*) and 16 (extra work due to the project, *Acredita que esta abordagem implique uma "sobrecarga"? Em que sentido?*).

[15] Since almost all answers emerged from teachers with some experience in the EP project (Eng-old and Sci-old), teacher code is not indicated throughout this table.

Ciências […] preciso por vezes que as colegas de Ciências me expliquem determinadas coisas porque […] eu não ensino Ciências [mas] para o projeto trabalho aqueles conteúdos […] o que obriga a planificar as coisas […] com bastante antecedência e […] com muita atenção, tINTER) or like a *dicionário ambulante* as she said once. In the EP programme we could, actually, read: *o foco das aulas e da aprendizagem está colocado na expansão da área vocabular relacionada com um conteúdo, tópico, tema disciplinar* (DOCS).

Table 8: subject representation and languages within project classes through teachers' coded answers; multimodal/multimedia language implies the co-use of multiple semiotic systems (images, sound, etc.); differences between Science and English teachers are underlined and described in the text.

Science representation within CLIL practice (2)	**English teachers**	
	a. planning, self-preparation – verbal language (foreign language, terms and <u>concepts</u>) b. planning, resource/strategy preparation – multimodal/multimedia language; verbal language (foreign terms); etc. c. implementation (Science teaching in/through a FL) – multimodal/multimedia language and verbal language (foreign <u>terms</u>) d. opportunities of professional education on CLIL (courses or through colleagues) e. assessment (general idea; issue of the FL)	
	Science teachers	
	a. planning, self-preparation – <u>visual language</u> and verbal language (foreign language and terms) b. planning, resource/strategy preparation – multimodal/multimedia language; verbal language (foreign terms); etc. c. implementation (Science teaching in/through a FL) – multimodal/multimedia language and verbal language (foreign <u>language</u>) d. opportunities of professional education on CLIL e. assessment (general idea; <u>criteria of Science</u>; issue of the FL)	

Assessment within integration. In addition to the planning and implementation issues, the Science teachers affirmed that the instrument for the Science assessment of project and non-project students only differed in the presence of a part in English, same criteria being used in the one for the Science subject (Sci-new, 74, *[as professoras de Ciências no projeto] ainda não construímos nenhum instrumento de avaliação específico […] penso que será semelhante àquilo que for utilizado nas outras turmas [mas com] uma parte em Inglês […] tem que se ter cuidado se calhar com alguma terminologia, com o domínio que eles têm*). Using the example of EP oral presentations, Sci-old related that she used to assess students primarily for their Science knowledge and competences, but also considering the English language formatively (164, *se eles me estão a apresentar um trabalho em Inglês [na nota que dou] o Inglês não posso tirá-lo [por*

exemplo] os trabalhos […] estavam muito bons independentemente [deles] terem falado melhor ou pior Inglês […] tive que avaliar o conhecimento científico […] a aplicação […] dou-lhes os itens […] que vão ser avaliados [mas depois forneço] uma visão global), as confirmed by observing group works on natural disasters and class debate on theories of the origin of life during EP classes (OBSV).

The teachers familiar with the project described the logics of texts assessing the Science learnt with English (Eng-old, 76, *nos testes de Ciências […] uma parte é em língua materna e [há] sempre um grupo em Inglês [com] um grau de complexidade crescente […] ao longo do ano*) rather than how English was used (Sci-old, 66, *nas Ciências […] não posso dar pior nota na minha disciplina porque eles sabem menos Inglês […] esta parte do teste […] em Inglês costumo mandar à [colega de língua]*; Eng-old, 76, *na disciplina de Ciências nunca penalizar o aluno pelos erros estruturais ou ortográficos cometidos em Inglês, desde que o aluno, com aquilo que escreveu, consiga comunicar a ideia*). That is, the EP schooling language was English but the degree of difficulty for answering in tests increased gradually, to support and encourage learners with initial language obstacles, as noticed in sessions of test design (OBSV) and detailed by interviewed former students (fsEcn_9, c., *no 7º ano era ligar assim coisinhas mais simples, mas no 9º já era composições mesmo em Inglês*; fsEcn_5, c., *os exercícios em Inglês do 7º ano eram mais fáceis, tipo de resposta fechada [mas] a partir do 9º […] três tópicos possíveis ou […] composições [para] serem em Inglês no teste de História, e nós tínhamos que estudar aquela parte em Inglês*).

Collaboration between teachers. In terms of roles that the Science and English teachers undertook during the co-taught classes, observation (OBSV, cf. parts in the tool of work I) completed teachers' voices (23 and 33) of the appendix previously referred to. In order to help the student understanding, Sci-old regularly presented Science topics integrating text in English with pictures, animations and quizzes; Sci-new tended to move through the classroom, making hand expressions and gesturing or modulating her voice. Eng-old was observed "representing the subject", through clarifying meanings and recalling concepts, labelling scientific and non-scientific words, symbolising (by means of arrows and math signs) or drawing sort of diagrams, on the whiteboard while her colleague was teaching Science. While planning, she once made clear that project classes, at least the Science co-taught with English ones, were not her lessons.

The researcher also witnessed teachers of the "English Plus" team asking themselves and reflecting on CLIL and non-CLIL practice, during the planning time and at other pertinent moments (OBSV). Moreover, in the final part (*reflexão crítica*) of the Science EP report (2015-2016), teachers involved in the project wrote: *o trabalho de equipa e a cooperação pedagógica*

interdisciplinar [levou] à implementação de práticas letivas criativas e inovadoras, à diversificação de métodos pedagógicos, materiais e recursos educativos utilizados em sala de aula (DOCS).

As a matter of fact, former students reported differences between non-project (single-teaching) and project practices (sINTER: n. 4, *Achas que havia diferença entre as aulas em que a professora de História e a professora de Inglês estavam juntas e as aulas em que havia só a de História?*), in roles assumed by the Language (English) and Content (History) teachers during co-taught classes and in strategies deployed to teach the specific subject through an additional language (cf. work III and its second figure). They related the development of alternative resources and effective activities (group works, game playing, video watching, theatre plays, school visits; some of them were also observed during the Science EP edition in 2015-2016) as well as of a clear teaching by means of language support and greater interaction, in order to overcome the students' difficulties in having to learn concepts through English:

> fsSci_11, c., *até as professoras de vez em quando necessitavam de utilizar uma linguagem menos técnica em Inglês. Para passar a ideia para os alunos […] a professora de História tentava de simplificar o máximo que podia para não tivermos muitas dificuldades a saber a matéria*;
>
> fsHum_10, c., *acho que essas dificuldades [da segunda professora de História com o Inglês] ajudavam com que ela facilitasse […] a expressão das frases […] ficava mais simples […] ela acabava por nos perguntar como é que podia conjugar aquele verbo, dizer aquela palavra e isso acaba também por ter uma interação entre professor e aluno […] mais no Inglês do que o Português […] era um facto*;
>
> fsSci_7, c., *a disciplina […] que nós falávamos só em Inglês, tínhamos mais auxílios, tínhamos mais algumas fichas mesmo para compreendermos melhor e para levar para casa […] do que em Português […] porque nós precisávamos sempre mais um pouco de ajuda na matéria que dávamos em Inglês [enquanto] a matéria que nós dávamos em Português era sempre um pouco mais fácil de integrar na nossa cabeça*.

Hence, the presence of English, in the students' point of view, represented a challenge also for one Content teacher that resulted in accurate and accessible practices to try to guarantee the understanding, as presented in the above-mentioned article. Their descriptions below corroborated the observation of the role of the English teacher in making the word meaning explicit and highlighting key concepts, mainly on the board, and the subject's one in teaching History:

> fsSci_1, c., *as duas professoras trabalhavam muito bem em conjunto [a de Inglês] se calhar tinha mais cuidado em dizer o que é que significa esta palavra no contexto em que está [enquanto que a outra avançava no assunto]*;
>
> fsSci_2, c., *ao mesmo tempo [que uma falava ou explicava, a outra] estava a apontar coisas no quadro […] havia conceitos que nós não sabíamos […] História em Inglês […]*

> *para nós apontarmos no caderno para […] no teste, [nos] exercícios em Inglês, sabermos […] o que é que dizíamos e […] escrevíamos*;
>
> fsSci_3, c., *a professora de História estava mais preocupada com o conteúdo da matéria, a professora de Inglês era mais com o nosso falar, com o nosso escrever da História em Inglês, com a nossa ortografia*.

Foreign language practice. The project provided an opportunity to improve English proficiency with no need for private language schools (fsSci_7, c., *nunca tinha andado em nenhuma escola de línguas*). As also observed during project Science classes of current EP students (OBSV), where speaking Portuguese was not allowed (or was limited to the preparation of final exams), communication was "pushed" to be in English. The use of English rather than the mother tongue functioned as a motivational factor, agreeing with Eng-old and Sci-old, who saw a clear advantage for students in learning within the project (see 8.2.2):

> fsEcn_4, c., *[com] a diferença na língua, nós estávamos muito mais curiosos a estudar em Inglês do que em Português*;
>
> fsHum_10, c., *em Português acaba […] por ser uma matéria muito puxada. Até porque foi uma matéria mais para decorar, [em Inglês] nós compreendíamos melhor*;
>
> fsSci_7, c., *dar a matéria em Português, damos em todas as aulas [mas aqueles] foram dois anos especiais em que demos realmente aquela matéria específica em Inglês*;
>
> fsSci_6, *c., começamos a habituar-nos a um certo ritmo de trabalho [em Inglês], em Português acho que deixava de ser tão interessante*;
>
> fsEcn_9, c., *ficamos mais atentos e com mais vontade de aprender por ser diferente*.

Moreover, 8 out of the 11 former students found English easier than Portuguese and expounded features of learning situations being facilitated through the use of it (sINTER: n. 5, *Lembras de alguma situação em que o facto de utilizar o Inglês facilitou a aprendizagem com respeito ao uso do Português?*). It was expressed by some as a general belief, though extra effort was needed, at least at the beginning of the project (fsSci_2, c., *acho que toda a gente concorda que o Inglês é mais fácil do que o Português […] mas no início […] não facilitou*; fsEcn_9, c., *é mais fácil aprender em Português […] no início tinha que estar a traduzir praticamente tudo […] depois estamos mais à vontade com o Inglês, [no] 9º ano já era praticamente a mesma coisa*).

A certain familiarity with the English language was a fact in their informal environment (watching movies or series and searching online) and could have determined this aptitude (fsSci_1, c., *basicamente aprendi Inglês a ver filmes e esse género de coisas […] comecei a me habituar mais*; fsEcn_5, c., *tudo que estou a ver na televisão também é em Inglês, já quase nem vejo nada em Português*; fsSci_11, c., *há muita mais informação em Inglês do que em Português […] disponível*

na Internet e em livros e outros materiais). The fluency in English caused by watching television was also asserted by Sci-new (tINTER) and noted among the younger students' Science+English experience out of school (sQUEST: n. 6).

A few students (fsSci_1 and fsEcn_t5 in c. of appendix G, for instance) claimed that writing in English was more comfortable than in Portuguese. The development of answers in the foreign language – gradually more demanding as seen above – was preferred, sometimes, to using Portuguese, an aspect that was also detected during the study (OBSV) and confirmed by teachers (Sci-old, 56-66, *verifico nos testes que eles acertam mais nas partes em Inglês do que nas partes em Português […] há aqueles alunos que até me pedem para fazer o texto todo em Inglês [ou] há aqueles que quando ponho uma questão ou duas de desenvolvimento em Inglês […] escrevem em Portugalês*, in Tab. 9).

Following aspects were adduced to explain the ease (in learning) with English in comparison with their mother tongue: morphosyntax

> fsSci_2, c., *em Português fazemos frases muito grandes […] em Inglês basta dizer só este bocadinho que já está lá a ideia*;
>
> fsSci_6, c., *em Português temos várias palavras para dizer a mesma coisa, acho que em Inglês conseguimos ser mais diretos nas ideias, [sem] andar muito à volta das coisas*;
>
> fsEcn_8, c., *os Portugueses acho que complicamos às vezes muito com a nossa língua […] estão ali muitos pequenos detalhes e o Inglês nem tanto e se calhar ao aprender em Inglês simplifica um bocadinho a matéria, fica mais concisa mais prática, é mais fácil de compreendê-la em Inglês e de aprender*,

syntax (less connectors, fsSci_2 and fsEcn_5); morphology (easier conjugations, fsEcn_4); semantic (fsEcn_8, c., *há matérias que tinham se calhar palavras muito específicas em Português*). An example of this "specificity", *cisalhamento*, was heard during one lesson (OBSV), matching with Sci-old's idea that *os Icnofósseis e os Somatofósseis [que se traduzem como] Trace fossils e Body fossils […] é muito mais fácil em Inglês do que em Português* (tINTER, in Tab. 9). When students demostrated a tendency to reflect, the interviewer invited them to reconsider their way of thinking, about the possibility that the related ease of English could stem from having to deal with and "make simple" a language other than our own, whose "grammatical meanderings" one could ignore. A reflection seemed to come out, thus, from some of them on the necessity of constructing essential sentences when the grammar mastery is not complete.

Also, a greater formal exposure to English was clearly embodied in the project:

> fsSci_1, c., *eu de certa forma sinto-me mais confortável em Inglês do que em Português porque nós também tínhamos mais horas a falar Inglês […] como se fosse a nossa língua materna quase*;
>
> fsSci_7, c., *as composições que nós fazíamos em Inglês eram sempre mais fáceis para nós de realizar do que as em Português […] porque nos sentíamos mais à vontade já em falar das matérias que dávamos em Inglês*.

As dislosed above, more attention was usually paid to lessons with a foreign language (fsSci_1, c., *quando é em língua inglesa […] ou outra língua, se calhar temos mais atenção ao que as pessoas dizem, se calhar captamos mais [e] ajudava-me muito porque [nos testes] era a parte que […] que eu me lembrava*) and this could have caused an additional carefulness while writing in English (fsSci_1, c., *nós temos tendência a […] escrevemos muito. Dizemos uma coisa aqui, contrariamos a seguir e […] eu tenho muito mais hábito de fazer isso em Português do que propriamente em Inglês [para o qual tento] fazer […] tudo direitinho. E se calhar [quando] estou a escrever na minha língua materna às vezes nem me apercebo nem releio*).

In addition, findings in work II showed that English was perceived to facilitate the learning and use of other languages (while travelling, at work, etc.), allowing students to become interested and acquainted with people from other cultures, and not only those of English native countries (*competências comunicativas interculturais*, according to DOCS). Self-confidence in the capability for FL grew from the first positive experience with English (fsEcn_5, a., *comecei a falar com outras pessoas de outras línguas e pensar noutras línguas […] eu pensava que […] não dava para falar outra língua sem ser o Português, que é a nossa língua e a partir do Inglês eu comecei […] a saber que é possível e não é assim muito difícil*). Also, English and the project broadened the learner's knowledge and vision (fsEcn_9, a., *o projeto […] despertou o interesse em […] vir a aprender outras línguas, porque é sempre diferente da nossa […] conhecemos outras coisas que aqui não conhecemos, o projeto […] nos permitiu abrir os horizontes*). Their voices reaffirmed the instrumental nature of English and of other languages and interwove it with the cultural and affective one.

8.2.2 Learning through a CLIL environment: advantages and difficulties

More generally, all EP participants gave their viewpoints on advantages and difficulties associated with learning a specific subject through an additional language, within the project setting.

Former students' side. Perspectives of former EP students about benefits for English and History improvement, the learning of scientific disciplines and teaching practices, have been already

illustrated (cf. work III[16] and previous section). In terms of problems encountered and overcome in attending the project that they identified during the interview (sINTER: n. 2, *Tiveste dificuldades durante o projeto? Se sim, quais? Como conseguiste superá-las?* and 9, *Quais as sugestões aos alunos do 3º ciclo que estão agora envolvidos no "English Plus" de Ciências Naturais?*), mainly the fact of having to use a foreign language for learning History – in processes of understanding, speaking, writing, interacting, asking questions and using the right words – came out. Some of them remarked that adaptation, determination and collaboration of all actors helped this obstacle vanish:

> fsSci_1, b., *no início […] não estamos habituados ao Inglês técnico de História […] mas […] começa a ser automático*;
>
> fsSci_6, b., *no primeiro ano do projeto tive assim um bocado de dificuldade, não estava assim muito habituado mas depois […] comecei a entrar dentro do daquilo que era feito*;
>
> fsSci_7, b., *as professoras […] para nós interiorizarmos o Inglês, tinham que falar Inglês […] ajudavam-nos obviamente […] foi esse facto de estar continuamente a tentar [que] no final tornamo-nos todos excelentes alunos em Inglês*;
>
> fsSci_11, b., *as professoras também estavam a adaptar-se a falar assim daquela maneira em Inglês. Principalmente a professora de História*.

Portuguese was resorted to when understanding was jeopardised (fsEcn_8, *quando tinha dificuldades em História ou não percebia alguma parte da matéria que estava em Inglês, ia perguntar às professoras, pedia para que me explicassem e tentavam explicar em Inglês e depois se eu realmente não percebesse explicavam-me em Português*). Teacher's check for learners' understanding occurred regularly (fsSci_2, b., *principalmente a professora de Inglês preocupou-se bastante em que nós entendêssemos tudo que era dito […] o facto da professora […] perguntar […] não era só a um ou a dois era a todos e eu então comecei […] a vontade de expressar*).

On the other hand, these learners seemed aware of their own difficulties and showed initiative in developing strategies for improving the understanding of the FL (trying to understand daily media, searching for meanings, reading books, etc.), and reported positive changes in skills, attitudes or practices, thanks to being part of the project:

> fsSci_2, b., *eu era uma aluna muito tímida pouco participativa, [mas com o tempo] consegui evoluir […] talvez graças ao projeto eu continuei a estudar Inglês mesmo fora da escola e agora já estou num nível muito elevado*;

[16] Besides answers to questions n. 1 (*Gostaria que expressasses a tua opinião sobre o projeto "English Plus " de História*) and 4 (see above), question n. 3 (*Qual a disciplina que mais beneficiou [...] com o projeto? Porquê?*) also contributed to the purpose of the paper.

> fsSci_3, b., *o projeto […] puxava por mim no sentido de desenvolver o meu vocabulário e a minha oralidade […] eu era assim um bocadinho envergonhada […] o projeto ajuda uma pessoa a estar mais desinibida e mais à vontade. Com a língua e com os outros*;
>
> fsEcn_4, b., *eu gostava muito de ir ao Google Tradutor […] uma vez que a professora me tinha dado [uma nota muito baixa], mudei! Comecei a ver programas de televisão, ler livros em Inglês […] o Inglês tornou-se cada vez melhor*.

The personal and educational experience of the students with the "English Plus" History project, learning obstacles but also benefits, was reflected in suggestions given to lower secondary school students involved in a similar project (EP of Natural Sciences). These ranged from recommendations of higher commitment to practical ideas – both at school during classes (asking questions, engaging in activities, etc.) and through autonomous work (the watching of series and videos without subtitles being the most frequent tip) – as well as reminding the importance of "not giving up" and "making the deal of concentration" to benefit from attending the project for the professional future, which is something also envisaged by the other learners. The importance of achieving good marks as well as rewards like participating in school trips abroad (London or New York, as witnessed during the study, OBSV) also emerged from students' voices, however, collaboration among members of the project and an alternative and enriching learning experience appeared as crucial features.

Teachers' side. Teachers described the advantages and difficulties that students could experience in attending the "English Plus" Science project through answers to different questions (tINTER)[17]. A summary of these advantages (ADV) and difficulties (DIF) is given (Tab. 9).

[17] n. 10 (teacher knowledge on CLIL and school examples of CLIL, see above), 12 (knowledge of the CLIL acronym and promotion of Science and English learning through CLIL, *Como imagina uma aula CLIL que integre os quatro Cês – Conhecimentos disciplinares; processos Cognitivos implicados; contextos Comunicativos; e aspetos Culturais – sugeridos em textos de referência? De que maneira pensa que o CLIL possa promover a aprendizagem das Línguas/Ciências?*), 13 (student assessment within CLIL, see above), 15 (expectations from CLIL as benefits and worries, *Tem expetativas em relação a esta abordagem em termos de benefícios? E de preocupações?*), 16 (extra work due to the project, see above), 17 (graphical representation of CLIL, see below) and 18 (free additional question).

Table 9: students' advantages (ADV) and difficulties (DIF) in learning with a FL through teachers' coded answers.

EP students and advantages and difficulties for teachers	**English teachers**
	ADV – increased English proficiency (Eng-new, Eng-old) ADV – expanded Science knowledge (Eng-new, Eng-old) ADV – different educational approach (Eng-old) ADV – extra-curricular activities (Eng-new, Eng-old) DIF – language obstacle (Eng-new, Eng-old) DIF – additional demands (Eng-new)
	Science teachers
	ADV – increased English proficiency (Sci-new, Sci-old) ADV – expanded Science knowledge (Sci-new, Sci-old) ADV – English's ease (Sci-old) ADV – different educational approach (Sci-old) ADV – extra-curricular activities (Sci-new, Sci-old) DIF – language obstacle (Sci-new, Sci-old)

In particular, both the English and Science teachers agreed on students becoming more proficient in the foreign language. Within the project (that is, Science classes with/in English), they learn English while using it (Eng-old, 62, *intuitivamente […] acabam por estar […] mais concentrados [e aprender a língua] Sem querer! Sem dar por ela!*; Eng-new, 80, *toda esta interação vai fazer com que os alunos beneficiem ao nível linguístico*), enhancing the learning occurring through traditional English classes (Sci-new, 90, *eles aprendem na mesma o Inglês […] no fundo acho que é um reforço*) and resulting in a communicative competence in English higher than other students (Eng-new, 86, *eles têm um à vontade muito maior do que os outros […] conhecimentos linguísticos muito mais abrangentes em termos de comunicação*; Sci-old, 184, *estes miúdos quando chegam ao 10º ano sentem facilidade [em comunicar em Inglês]*). This, actually, matches with former students' descriptions (sINTER: n. 1-2 and 4-5), and one major objective (*aprendizagem mais rápida e eficaz da lingual estrangeira* and its macroskills through a *abordagem holística do ensino da língua, numa perspetiva comunicativa*) of the EP project (DOCS).

Moreover, all teachers related a greater knowledge in the specific discipline, notwithstanding the fact that this educational goal was not explicit either in the whole school *Projeto Educativo* 2014-2017 or the *Programa da disciplina de oferta de escola* 2015-2016. Instead, *domínio em língua estrangeira dos conteúdos da disciplina não linguística*, *mobilização de conhecimentos* in specific activities linked with Science (trip to the "Arouca Geopark" or "Dante's Peak" movie watching), *motivação dos alunos para a aprendizagem […] da(s) disciplina(s) não linguística(s) envolvida(s) no*

projeto or a *promoção da inter/transdisciplinaridade* were found in the above-mentioned report (DOCS).

As noted during sessions of project time (OBSV), students achieve additional and alternative information (Eng-old, 66, *[na hora de] projeto eles acabam por também aprofundarem mais, terem informação extra e de forma lúdica [e por] ganhar outro tipo de conhecimento*; Sci-old, 122, *eu nunca tinha dado uma aula sobre dinossauros [porque] não tem a ver com o programa […] fazemos isto em Inglês […] para aprenderem vocabulário [e] para terem contato com uma coisa científica*), also useful in the future (Eng-new, 80, *ao nível das Ciências […] em termos futuros já terão ouvido falar de conceitos [em Inglês]*). The presence of English in the project enables learners to perceive Science as "universal", in Sci-new's opinion, broadening the knowledge and the vision of it (68, *a Ciência […] acaba por ser um esforço da humanidade […] um recurso […] para a compreensão do mundo […] a resolução de problemas, [o projeto] ao ter a questão da língua se calhar alarga um pouco mais esta visão de uma coisa […] para além do país*), an aspect already highlighted (cf. work II) and consistent with the insight into the subject gained by students, as clear in the next section.

Like the ex-EP students (sINTER: n. 4) and in the *Relatório* of EP 2015-2016 (DOCS), teachers clarified that the EP project entailed a different educational approach, for and within which teachers work in team (*partilha, em conjunto, de parte a parte*, *troca de ideias* or *de experiências*, *grande colaboração*, *núcleo de trabalho*, *trabalhando em equipa* or *em parceira*, etc. from different voices and moments of tINTER) and learn for their students and together with them. In other words, working through the CLIL approach was considered as a benefit for both teachers – *houve elevados níveis de motivação e, claramente, uma valorização de competências específicas e da atividade profissional, num processo que também para as professoras é de constante aprendizagem*, as related by teachers in this report and during the interview – and students. The two teachers experienced with the project remarked on the development of non-conventional teaching practices that appeal to students, who engage themselves and learn motivated.

According to Eng-old (62-74), *nós hoje em dia na escola temos dificuldade em captar a atenção dos alunos [aqui] acaba por ser uma abordagem diferente […] ainda prevalece um pouco em muitas disciplinas a prática expositiva […] acaba por se fazer os alunos interagirem, entrarem […] muito mais na aprendizagem […] naturalmente, sem que seja necessário um grande esforço*. Also, the project time itself was planned as a context for developing group works – not feasible otherwise as interview revealed – and task-based learning (DOCS). According to Sci-old (154-164), *promove a aprendizagem […] torna muito mais interessante. As Ciências e a Língua, […] o ano*

passado [houve trabalhos de grupo] sobre a origem da vida […] eu dizia vocês têm que tentar deitar abaixo os vossas colegas para mostrar que é a vossa teoria a que está certa. Isto em Inglês […] gerou um debate fabuloso e fez-lhes brilhar. Similar works and their preparation were, indeed, observed during the study, even if participation was not extended to all learners (OBSV). These strategies and activities (debates, plays, songs, cinema, etc.) were described to encourage different learning styles and even "invert" expectations of learners' performance (Sci-old, 166, *às vezes estamos […] com muitas expetativas de determinados alunos [com] muito boas notas e tudo [mas] são pouco criativos e outros são extremamente criativos e fazem coisas fantásticas*).

Finally, the organisation of extra-curricular activities (Eng-new, 66, *há muitas atividades […] teatros […] contatos com a embaixada norte-americana […] saídas a Lisboa*; Sci-old, 56, *há assim tanta coisa […] que se podia fazer [no âmbito do projeto] coisas que são engraçadas*), in which families are also involved (Sci-new, 52, *aqui na escola [há] bastante interesse da parte dos alunos e das famílias a integrar o projeto*; Eng-old, *um [outro] aspeto positivo desta implementação é aproximar as famílias à escola*), was referred to as being part of the "English Plus" project and regarded as a fundamental achievement in the report mentioned above (DOCS). Theatre performances connected to Science topics were reported at the end of the 2015-2016 school year for all EP groups (OBSV and DOCS) and described by Eng-old (86, *nós sempre fizemos […] pequenas dramatizações com os alunos […] textos canónicos [mas] totalmente reescritos por eles […] incluíram dois cientistas [assim como] o Camões […], os cientistas explicavam de acordo com o que tinham aprendido na disciplina de Ciências os acontecimentos do Macbeth, a Lady Macbeth era por exemplo a predadora […] uns eram parasitas […] aquelas relações hierárquicas*); she added that these demanded extra effort for the text memorisation, though accepted by students and appreciated, as heard from the interviewed high school ones (sINTER), because they gained confidence with an audience.

EP students might have some difficulty with language understanding, for having to learn specific vocabulary and how to speak and write fluently. However, as actually experienced by former students, the issue of having to get used to being taught in a foreign language, for Eng-old, will fade out (88, *alguns alunos no início [...] sentem muita dificuldade [mas] se vai atenuando [...] no 8º ano [assim] para a maioria dos alunos ter uma aula de Ciência em Inglês ou em Português é a mesma coisa*). After having taught previous project students, she was confident in affirming that the language learning obstacle is not different from non-project English classes (92, *na minha disciplina [Inglês] também iria […] recuperar aqueles que vão ficando para trás mas não acho que é o CLIL que em si cause mais preocupação*). The two Science teachers also relativised this possible

problem, saying that *a partir do momento em que gostam não consideram sobrecarga* (Sci-old, 134), in fact, *geralmente estes alunos não têm tantas dificuldades porque a seleção que é feita já é com base nas notas deles* (Sci-new, 48). Marks could decrease from previous outcomes, also because of more difficult topics (Sci-old, 72, *a matéria de Ciências do 7º é difícil [...] em Português já [...] vêm do 6º com notas brilhantes depois começam a descer um bocadinho*).

Teachers did not consider significant the additional concentration and higher dedication that the attendance of the project demands of students:

> Sci-old, 132, *eu só peço trabalhos de casa [...] quando é um relatório ou [...] têm que apresentar em grupo [...] ali têm […] tempo para preparar também nas aulas*;
>
> Eng-old, 86, *em termos de atenção e concentração que lhes é exigida nós tentamos sempre que isto não implique trabalho extra […] em casa do que aquilo que seria normal*;
>
> Sci-new, 74, *o esforço que têm […] depende do gosto que eles também tenham pelas Ciências e pela Língua, [o projeto] exige [mas] não lhes aumenta a carga horária, eles vão ter tempo exatamente como os outros para amadurecer o conhecimento*.

Only the new English teacher (76-78) recognised that students *terão que ter um trabalho acrescido em casa […] em termos de vocabulário eles vão ter que se dedicar […] poderá ser [um esforço da memória e cognitivo], vão aprender os conteúdos de Ciências, vão aprender o Inglês ao mesmo tempo*. During the interview, actually, teachers seemed to be worried about the time required of themselves to sustain quality teaching through the EP project (cf. voices 14, 20, 21, 23, 26, 31 in the appendix of work V), also including preparation of activities and visits as well as reflection on practice, a concern not disconfirmed within observed and reported practices (OBSV and DOCS).

Current students' side. Despite teachers' answers, among current students (sQUEST: n. 21) an extra effort was the most represented (almost 40%[18]) concern (*retira muito do tempo dos alunos para descansar*; *é um projeto muito exigente e trabalhoso*; *necessitar de bastante tempo de estudo, o que pode levar a ter menos tempo para outras disciplinas*). They also felt an higher teacher expectation as a disadvantage (*sermos desbeneficiados porque as professoras acham que só por estarmos no English Plus que temos que saber tudo e não podemos errar*). EP settings were perceived by some learners as difficult (*[temos] algumas dificuldades que não existem em outras turmas*; *turmas grandes e [um contexto] um bocado cansativo e confuso*).

[18] The 13% related in work III is a mistake, constituting an absolute frequency and not a percent value.

Nevertheless, less than 25% – the majority of them being students with already one year in the EP project – referred to language understanding as an obstacle (*o facto de que deviam explicar em Inglês e em seguida em Português. Raramente o fazem*; *se não entendermos bem Inglês não percebemos a matéria dada em Ciências*). It is possible that students who had less experience with the project (7th vs 8th graders) could not fully understand the weight of this issue; also, more than half of these students did not answer. On the other side, the English proficiency noticed among these Portuguese students allowed them to follow and participate during Science classes (and to continue in the FL also when the class was over), or to make clear to teachers when they did not understand (OBSV).

Findings in terms of importance given to the EP project of Science and advantages connected with it (sQUEST: n. 18, *Como consideras o Projeto "English Plus" em Ciências? Muito importante – Importante – Moderadamente importante – Pouco importante – Nada importante – Não sei. Justifica a tua resposta*; n. 20, *Na tua opinião, que vantagem(ns) poderá ter este Projeto?*) have been already presented (cf. work IV and III). The table in the following part (Tab. 10) shows categories and coding constructed to describe them (descending order of A) sub-codes in the published work was changed).

8.2.3 Participants' vision of the Integrated Learning implied in the project

Current students. In order to explore conceptions about the EP project originating from all learners (extracted from answers about the importance and advantages of having Science together with English at school among current students), even codes consisting of just one quote were accepted.

Table 10: coded answers to questions n. 18.1 and 20; occurrences of students' quotes are shown in brackets; absolute frequency for each category is also provided.

CATEGORY	Importance of the EP project (q18.1)	TOT	Advantages of the EP project (q20)	TOT
A) Composite learning	a. learning Science with English (4) b. learning Science in English (10) c. greater learning of both (3) d. increased vocabulary of both (4) e. improved Science learning and English vocabulary (1) f. improved Science vocabulary and English proficiency (1) g. scientific English mastery (8)	31	a. learning Science with English (2) b. learning Science in English (3) c. greater learning of both (3) d. increased vocabulary of both (2) e. improved Science learning and English vocabulary (1) g. scientific English mastery (1)	12
B) English sphere	a. vocabulary increase (4) b. language improvement (11) c. importance of this language (3)	18	a. vocabulary increase (7) b. language improvement (27)	34
C) Lifelong learning	a. broader/richer knowledge (12) b. one's general future (6)	18	a. broader/richer knowledge (16) b. one's general future (5)	21
D) Prof/Acad future	a. getting a job (3) b. studying/working abroad (4) c. Science studies (5)	12	a. getting a job (9) b. studying/working abroad (2) c. Science studies (1)	12

Advances in the language sphere such as a greater English vocabulary and improvement of the English language (learning) in general was the main advantage for these Science learners, as well as for teachers and older students. Contributions associated with the C)a code did not refer to as scientific knowledge per se; only some idiosyncratic answers specifically or indirectly mentioned it (*ajuda-nos a compreender melhor a matéria que demos em Ciências*; *um dia se eu for professor de Ciências posso dizer em Inglês o que aprendi quando era mais novo*). Here, the field related to future studies and job was not as frequent as within the importance attributed to FL (cf. work II) and has a level similar to the Science one[19]. The "composite learning"[20] category was the most reported reason for the importance of the project. Occurrences of the coding relative to both importance and advantages, in the case of A), were merged and drawn in Fig. 6 (e. and f. were excluded because relative quotes occurred less than 10%), to represent aspects of learning associated with both the foreign language and the specific subject, and, finally understand the

[19] The sum of the code occurrences corresponding to the professional/academic category for importance of foreign languages (people who emigrate, getting a job, use at work and studies also abroad) is around 38%, whereas here and with Science, we get 15% and 20%, respectively.

[20] Quotes included here mentioned both Science (general knowledge was not considered) and English/Language, as a sum or mix of "learning aspects" and in other combinations whereby Science and English were explicitly related, such as the case of the scientific lexicon in this foreign language.

meaning of Integrated Learning embodied in CLIL in the vision of students participant in the CLIL-type "English Plus" project.

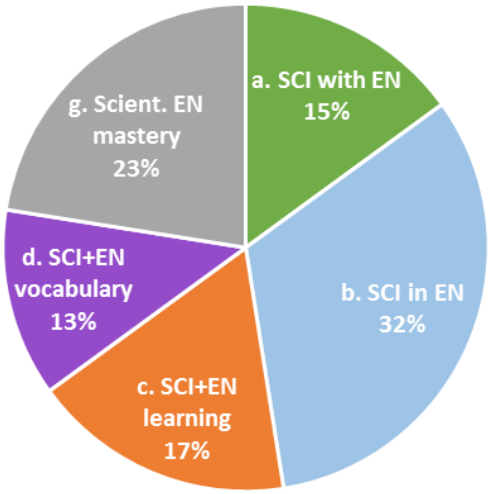


Figure 6: A) composite learning, possible associations and relative percentages.

In considering their voices fundamental, also to identify attitudes to the learning of Science alongside English, interesting quotes associated with these codes are provided in this box:

a. learning Science together with English
- *estamos a aprender ao mesmo tempo duas coisas, a matéria de Ciências e Inglês*
- *permite-nos melhorar o nosso Inglês enquanto aprendemos Ciências*
- *assim conciliamos duas disciplinas e conseguimos torná-la numa só, o que ajuda na nossa aprendizagem*

b. learning Science in English
- *temos as aulas de Ciências dadas numa língua que não é a materna*
- *em vez de só aprendermos Ciências numa língua, aprendemos as Ciências em Inglês*
- *o projeto dá-nos a possibilidade de aprender as teorias do Mundo na língua universal*

c. greater learning of both Science and English
- *aprendemos mais coisas sobre Inglês e sobre Ciências*
- *ajuda na compreensão da matéria em Inglês e Ciências (espaço para tirar dúvidas)*

d. increased vocabulary of both Science and English
- *assim se poderá ter um vocabulário mais avançado a Inglês e a Ciências*
- *aumenta o vocabulário Inglês (só de Inglês) e aumenta também o vocabulário de Ciências em Inglês*

g. scientific English mastery
- *aprendemos novas palavras sobre Ciências em Inglês*
- *para melhorarmos a língua inglesa em termos científicos*
- *muitas vezes na nossa vida vamos ter de lidar com muito vocabulário em Inglês, e se tivermos a noção do vocabulário científico em Inglês, é muito fácil para nós*

Therefore, students acknowledged that the CLIL-type EP provision implied the learning of both Content (Science) and Language (English), this category being the most represented one, at least

in terms of importance (cf. previous table), yet, more than half of the answers conveyed the learning of Science in English and the acquisition of scientific terms in English (32% from b. + 23% from g., but also 13% from d., in Fig. 6).

Former students. With regards to the students who attended the History EP project, as previously noted (cf. work III), 6 out of 11 associated the project with a "composite learning", that is, explicitly alluded to both a learning of History and of English. Although most of times the project was referred to as "classes of History in English", the words of two students offered a noteworthy learner contribution of what Integrated Learning may mean

> fsSci_7, b., *penso que o projeto […] permite que [os alunos] se foquem não só em Inglês mas também em História […] ao usar a língua assim dessa forma […] que por si só […] ao deixar de ser só sobre aprender […] os vocábulos e a língua, começamos a ficar mais interiorizados com a língua em si e começamos a usá-la mais facilmente […] e torna a matéria que estamos a dar [com] uma forma mais original*;
>
> fsHum_10, b., *não aprendemos só o Inglês na disciplina de Inglês, que é basicamente números os verbos e assim, aprendemos […] sobre uma História diferente […] que nós não temos tanto este leque na disciplina de História […] no 3º Ciclo e no secundário […] aprendemos […] a expressar melhor em Inglês também […] foi benéfico*.

This clarifies the importance connected with it for the learning of both the linguistic and non-linguistic disciplines, other than just learning History in English: the learning of both becomes authentic, English is learnt naturally and History is somehow expanded, as also disclosed before by teachers. In addition, a great sense of students' membership and responsibility came out:

> fsSci_7, b., *o facto de nós termos a História em Inglês […] nesta escola […] nós fomos pioneiros […] também nos deu uma responsabilidade […] mesmo fora do projeto havia essa [intensa] relação com os professores que este projeto proporcionou […] em todas as atividades […] durante aquela aula que nós tínhamos extra […] estávamos todos a trabalhar pelo mesmo*;
>
> fsSci_2, d., *até mesmo a viagem que nós fizemos no final do 9º ano […] deu-nos um sentido de responsabilidade porque […] grande parte do dinheiro que nós conseguimos […] fomos nós que o arranjámos, fomos nós que tivemos ideias […] e claro que nós também crescemos com tudo isto […] foi uma boa preparação para os anos futuros,*

which are lifelong skills and competences matching those also mentioned in the *Relatório de Atividades "English Plus"* 2015-2016 (*de autonomia, de espírito de iniciativa e de empreendedorismo*, DOCS). Some students declared their desappointment that project-like classes had not continued at high school. The following quote is significant to summarise key aspects of the learning experience embedded in the CLIL-type "English Plus" project, enriching the sense of Integrated Learning for these people:

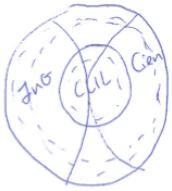
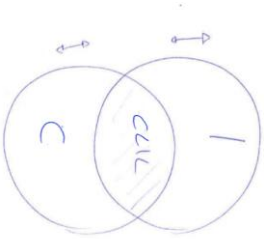
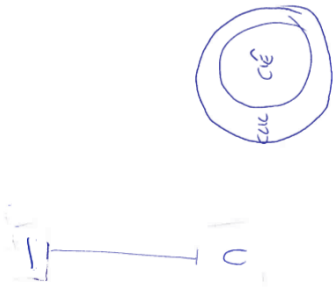
> fsSci_3, d., *[tive] História […] até ao 6º ano [de] uma forma muito metódica, muito aborrecida e [com] o projeto tínhamos História de uma forma mais dinâmica e as próprias aulas eram muito mais de diálogo e a professora ensinava de uma forma diferente […] a que tinha antes do projeto era capaz de estar a falar e ela só a ler o manual e a escrever no quadro. No projeto […] víamos vídeos, a professora exprimia-se de uma forma diferente, fazíamos as tais representações […] e apresentávamos aos pais […] e assim interligávamos o Inglês com a História de uma forma […] que me captava mais a atenção […] nós tratávamos dos problemas da turma [em Inglês] e também tínhamos mais tempo para o projeto em si […] depois optámos também por ter algumas aulas de Ciências em Inglês […] dá-nos uma ideia mais geral e mais abrangente do que a matéria só em si [do] manual […] o vocabulário era muito mais desenvolvido e […] nós conseguíamos pegar nesta frase […] e pesquisar mais sobre este assunto, não ficávamos só por ali, queríamos explorar mais*

showing the project contribution also to the achievement of "transversal" competences (*ser responsável; organizar, executar e avaliar atividades de caráter diverso; aplicar métodos de trabalho e estudo; falar e apresentar-se perante um público*) and to the learners' self-concept reinforcement, as declared in the teacher EP report (DOCS). Furthermore, students observed in 2015-2016 were "twinned" with another school where the "English Plus" project was also implemented, and shared letters and cultural and educational moments with its students (OBSV).

Teachers. Concluding with the teacher's angle of CLIL, we present in Tab. 11 sketches and voices provided when they were asked for a graphical representation[21] of it (tINTER: n. 17, *Qual é a posição/distância do CLIL com respeito à disciplina linguística e à Ciência? No sentido de representar graficamente, através de um esquema ou desenho ou mesmo palavras, para conhecer a sua perspetiva…*).

[21] After having transcribed and analysed their descriptions, we realised that it would have been useful to interview teachers and let them draw at home, in order to release some preassure they felt and to give them the time to think, leaving the discussion for a different moment.

Table 11: graphical representation of CLIL according to EP teachers and description while they were drawing.

Teacher	Drawing	Description
Eng-new 80-86		*O Inglês é fundamental a todas as áreas e cada vez […] mais […] com CLIL o Inglês [dá] a contribuição nas aulas de Ciências [úteis, por exemplo, para quem for para Medicina], acho que há aqui uma interação muito grande, acho que não se consegue dissociar [por isso, estas setas] alunos que já frequentaram […] comunicam muito melhor do que qualquer outro aluno e penso que […] o facto das Ciências terem sido lecionadas em Inglês [faz-lhes] imenso desenvolver as competências linguísticas. Por isso imagino uma grande relação não sei! […]. Faça-me esta entrevista daqui a 2 meses*
Eng-old 100-102		*Queria pôr […] o CLIL […] no meio, [entre] Inglês e Ciências […] até [a] abranger a totalidade […], a entrar completamente no Inglês e nas Ciências, [de maneira] gradual*
Sci-new 94-100		*Eu faria um diagrama de Venn […] uma coisa deste género, com […] um espaço de interação [que pode] afastar ou juntar mais dependendo das aulas, dos temas, do entrosamento com os alunos, do trabalho que fizermos em parceria, [esta] vertente de chega para cá chega para lá [como das setas com dupla direção] dependendo da organização de um dia ou de um tema ou do interesse dos alunos*
Sci-old 194-210		*Um quadradinho, uma bolinha […] eu acho que punha uma coisa aqui e outra coisa aqui […] pediu uma distância? Eu acho que posso englobar uma na outra, não é? […] em termos de distância, tipo uma medida, [no desenho, estão o Inglês e as Ciências] é assim. O CLIL pode abranger outras disciplinas, não é? Portanto punha o CLIL maior e as Ciências lá dentro […] claro que não estamos num colégio inglês mas o ideal era dentro de uma turma o CLIL poder abranger mais disciplinas*

In sum, CLIL was positioned in the intersection between Science and English at school, which changes according to the context (Sci-new) or will eventually include both (Eng-old). In Sci-old's opinion, it already included Science, whereas a relationship between CLIL and the foreign language was remarked by Eng-new. With the exception of Eng-old, teachers provided arguments in explaining their artifact, contributing to understand their conceptions: benefits in terms of

English but also Science (Eng-new); challenge of learning Science with English (Sci-new); possibility of implementing more than one subject within the CLIL approach, somehow reproducing the implementation of immersive formats (Sci-old). Similarly to what was reported about classes of "English Plus" in the 2015-2016 school year (DOCS), this last teacher mentioned the case of one EP class that had different subjects through the project: *este 9º que vamos ter, teve uma altura em que as Ciências e a História eram as duas English Plus. E complementavam-se […] até uns já tiveram uma aulinha de TIC em Inglês, outros tiveram uma aulinha de Matemática [sem a colega de Inglês estar, mas] ela esteve também numa de Físico-Química* (210).

"English Plus" was framed, in the EP *Programa* and *Relatório*, as one CLIL approach for bilingual teaching and the project discipline as of the English teacher, who gave English through Science topics during *hora de projeto* (DOCS). This could explain the tendency of students in relating especially to Eng-old, to deal with issues of the project, and the fact that the student formative assessment of the project was carried out during her hour (OBSV). Moreover, regarding Science planning, Sci-old explained to the researcher that *fazemos as planificações em conjunto [com as outras professoras de CN]. As gerais são iguais. A única diferença [com as turmas não EP] está na realização da aula [e na organização de] outras atividades* and Eng-old completed saying that *não fazemos planificação para o English Plus […] a planificação de CN [apresenta] pontuais introduções de aspetos culturais, literários, etc. ou preparação de atividades que surjam.*
However, perceiving EP classes as subject ones, we developed the "Language use in/and Science learning in interaction" tool (cf. work I) with the aim of supporting and orientating "Science languages" within the (CLIL) Science teaching practice. It is comprised of a diversity of contributions, literature-founded and context-derived, as follows:

- **A.** Science classroom discourse;
- **B.** Science genres (doing, explaining, arguing, etc.) and language-based approach (register);
- **C.** Science and English co-teaching in CLIL classes;
- **D.** Language demands in Science performance of learners of English as a L2;
- **E.** Teacher scaffolding strategies in (language) content-based instruction;
- **F.** Language-focused Science education and representation modalities;
- **G.** 5E (engage-explore-explain-elaborate-evaluate) instructional model in Science education;
- **H.** Relevant episodes; classroom representation and space occupied; etc.

Following overview (Table 12) systematises the information gathered through observation, documents, teachers and students. C (content), L (language) and IL (integrated learning) are used in it as divisions to organise associations with, respectively, Science (both in non-project and

project settings), English (both in non-project and project settings) and teaching/learning issues connected with both Content and Language or with project aspects. This is aimed at supporting the discussion along with answering to our research questions (see next section).

Table 12: overview of evidence; EN = English, EP = English Plus project, FL = foreign languages, FR = French, PT = project time, SCI = Science.

	Observation and documents	**Teachers**	**Former students**	**Current students**
CONTENT	• school projects linked to SCI • non-project SCI planning • non-project SCI lesson time • turns of half class at the laboratory • bare walls • teaching styles • use of specific lexicon, diagrams and graphs, and other activities • complexity of SCI curriculum • no report of developed SCI skills (within EP) • *provas de aferição de Português e Matemática*	• posture with SCI practical activities • opinion on SCI knowledge construction and cultural aspects • practice of SCI languages (lexicon for non-experts; EN in resources and for communication; subtitles in videos; visual, symbolic, operational, etc.) • students' deeper SCI knowledge and vision (within EP)	• SCI information and terms in EN • SCI (future) choice of study • different and improved SCI teaching (within EP)	• SCIs as middle favourite subjects • attitudes towards SCI learning and knowledge • contexts of daily contact with SCI • difficulties with SCI learning • suggestions of SCI representation and practical activities • no mention to SCI learning as a benefit (within EP)
LANGUAGE	• "English Plus" project (seen as bilingual teaching) and FR+ • EN planning • EN (and FR) lesson time • PT time led by the EN teacher • movies, series, etc. without dubbing • participants' proficiency in EN • FL used also when classes were over • report of developed language and intercultural skills (within EP)	• EN associated with English native countries • initial difficulties in language understanding (within EP) • possibility of ease in learning through EN (within EP) • students' higher proficiency in EN (within EP)	• different and increased EN learning (within EP) • difficulties (overcome) in learning through a FL • facilitated learning through EN also for the need of higher concentration • EN and the learning of other languages and about other cultures	• EN as the most favourite subject • attitudes towards FL learning and EN knowledge • idea of eventual emigration • EN learning as the main advantage (within EP)

INTEGRATED LEARNING	• system to accept students in EP classes • teachers involved in other projects • no EP-SCI planning • teacher co-planning • EP (Natural Sciences) and PT (of and on SCI) lesson time • bare walls • teaching styles and roles • use of specific lexicon, diagrams and graphs, and other activities • oral practice (class debates or theatre plays on SCI topics) • translation request • subtitle avoiding • collaborative and project works • extra-curricular activities, trip organisation and "twinning" with another school • teachers' teamwork, learning and satisfaction • students looking lost or tired (sometimes) • report of cross-curricular competences	• time-consuming preparation of EP lessons, activities and events • EP practice of SCI languages (terms and translation; multimedia use; verbal sequence and visual aids; etc.) • teacher education and student assessment within EP • initial difficulties in language understanding within EP • possibility of ease in learning through EN within EP • different and more involving educational approach, both for students and teachers • extra-curricular activities and families' involvement • mild additional effort required of students within EP • spoken/drawn conceptions of CLIL	• SCI information and terms in EN • SCI learning and method of study • learning as EP active members • difficulties (overcome) in learning through a FL • different teaching roles and strategies • "composite learning" interesting quotes	• contexts of daily contact with SCI • difficulties with SCI languages • suggestions of SCI representation and practical activities • importance of "composite learning" within EP

9. Final Remarks and Future Perspectives

This study had, as a primary concern, to answer to *What practices of Language(s), within non-project Science education (when the mother tongue is used), are experienced by the "English Plus" Teachers and Students?*. As already expounded in the state of the art, "Science languages" constitute opportunities for representing and communicating Science concepts and processes, through a diversity of languages – verbal (spoken and written), visual (graphs, tables, diagrams and drawings), mathematical (formulas, equations, calculations), kinaesthetic (action and observation to make sense within experimental procedures and operations), etc. – for the Science knowledge construction. The language has an important role.

In the empirical tool that we developed for the observation and supervision of the language use in/and Science learning (cf. Piacentini et al., 2017), it is clear that the verbal language should also entail scaffolds such as using the first plural person, waiting for the student to answer or developing questions gradually in support of the learners' Science understanding, that are not fully availed as possible teacher strategies. Similarly, non-verbal interventions in the classroom (modulating gazes, using gestures, moving through the space, etc.) are fundamental to convey (Science) meaning and can make a difference to capture the attention of students and involve them in the learning of concepts and processes during classes, but they rely on the teaching style: one teacher would be still next to the computer desk in front and another one would track linear movements, to cite one case. In addition, there are not classrooms having helpful visuals on the wall, for instance, to summarise borders of plate tectonics, to show an ecological relationship, to list elements of the body systems or to make equations always visible, aids which do not prevent students from constructing knowledge, on the contrary.

Referring to one question asked to teachers, we can claim that the Science teacher is a teacher of languages: visual, symbolic, operational besides the "obvious" verbal one (cf. Piacentini et al., 2019); thus, teachers are responsible for supporting learners in the (re)construction of the language of Science that, even when the mother tongue (here, Portuguese) is used, can be unknown like a new foreign language. As a matter of fact, students' difficulties with the learning of Science are also associated with obstacles in "deciphering" the different modes (understanding the information modelled in concept maps, arguing ideas in debates, etc.) that are used for representing or communicating it. However, teachers expert in this subject, which they had learnt at university and have always taught, may not perceive the existence of these difficulties. For example, the understanding of specific terminology as well as of visual representations, during Science classes, is often taken for granted, in the sense that it seems that "it just happens".

Nevertheless, many scientific terms are “conceptually dense” and require a process of “mediation” through clarification (paraphrasing or explaining, making a drawing, using gestures) from the teacher. Moving to the level of graphic information, even the “simple” water or nitrogen cycle diagram (simple, when compared, for instance, with the graph of the Carnot cycle) is “stuffed” with symbols having specific meanings: direction and colours of arrows, substance formulas, images. This is something that needs to be “practiced” to be learnt, by students as much as by non-Science teachers (as they declared) and future citizens responsible for taking decision about socio-scientific issues.

Therefore, in order to develop Science knowledge, time has to be devoted to the construction of Science languages and communication, also because if Science is not made available for a wider audience, it is not “finished Science”, a view of Sir Mark Walport internalised by one teacher. Unfortunately, there is no space in the school learning environment for such a practice. This is because Science teachers are not used to it or, better said, they did not train/study to undertake a “language focus” in the teaching of their subject, and due to the school pressure for students to achieve performance goals and pass written exams. From the perspective of the researcher, who is a Science teacher of the Italian school system – where, at least before completing the 8th grade, Natural Sciences and Physics-Chemistry are merged into the “Natural, Chemical and Physical Sciences” curriculum (and combined with the teaching of Mathematics) that is not prescriptive and relatively flexible – a sensible teacher work aims, rather than to have an encyclopedic classification of minerals or species or every single component of the digestive system, to “cultivate” principles underpinning the study of core Sciences – i.e., in Biology, structure vs function; in Chemistry, molecular organisation and macroscopic behavior; in Geology, cycles and present features vs past processes – through relating to everyday experiences and basing the learning on inquiry.

Having said that, the use of the Science laboratory is a fact in Portuguese schools, and a “facilitating” factor is that the teacher works only with half class for the construction of concepts through the development of practical or experimental activities, allowing for the practice and promotion of the kinaestetic language and intelligence, though conditions created through a simulation of a phenomenon are different, conceptually and linguistically, from those of an activity for which variables are involved. We consider that the use of “manipulatives” or “realia” should be resorted to also within non-laboratory classes, representing opportunities for pupils to learn through a variety of styles. The presence of school projects providing a contextualisation to the knowledge of Science and other subjects can increase the Science relevance for students, but

a “project posture” (by means of problem solving and scientific inquiry) should be embedded in regular lessons rather than being something performed and assessed separately, also taking into account that teachers are often “busy” on different fronts.

The characterisation of the relationship between “Culture” and “Science” (cf. Piacentini et al., 2016), which tries to address the research also to the “affective component” of student cognition, reveals that the vision of Science as integrated into and with the general culture is predominant among younger students, who deem it to be important for understanding and living in the environment, for personal development and everyday use, applying terms and concepts related to scientific activities and showing that they are relevant for their daily lives. After all, Science is considered to be everywhere. In enabling the understanding of Science topics, a scientific practice (observation, experiments, etc.) and a different posture with common events, also the Science curriculum is attributed a relevance. The idea of a “scientific culture” also emerges, from those who regard as important the learning of Science specifically for studying Science at university or working in the area of Science. For the Science teachers, cultural aspects are not irrelevant to Science, since Science is viewed to make sense to everyday life and can be linked with local and non-local people’s knowledge. Moreover, scientific disciplines and practices are thought, by individuals learning Science or, at least, not familiar with it, of either with a deep trust (EP students of different ages), admiration or distance (the two English teachers). In general, it seems that Science is perceived by teachers and students as the hardest “matter”, whereas, from an Italian viewpoint, the high school choice of Science studies is seen as difficult as classical Humanities.

Teachers and older students identify English as the language often used in Science and in resources of Science education, such as videos, magazines and other educational material more diversified in this language than in Portuguese or any other language. Here, we have to bear in mind that English is a fixture in the Portuguese television and, needless to say, English has a role in Science for both students (the language of broadcasting) and teachers (the language of research), which demands a careful discussion at school on Science nature and history, scientists’ non-just-English origin and the mean used for communication, which should not exclude other languages (cf. Piacentini & Simões, 2020). Contexts where learners experience Science alongside English are scientific documentaries on channels such as National Geographic or Discovery Channel, news available on television, visits during which information is shared through the language, etc., which are all spaces where the subject is communicated, disseminated and elucidated. This is another reason to infer that the language matters in Science. Since the Science

and language construction at school should not be separated from the daily contexts learners have contact with, we consider that the teacher acquaintance with these contexts may orientate practice for a meaningful integration of Science with English.

However, the teaching of Science is acknowledged as helping students also to master their own mother tongue and being an environment for literacy development. At the micro level of classroom practice, we see Science classes as a space where an explicit focus on Language can be undertaken, as the observation instrument mentioned above – with the key meaning making features based on Mortimer and Scott's work (2003) – displays. Prospectively, it can facilitate the orientation of teacher practices in future studies towards a language across the curriculum including Science. Retrospectively, it can assist in reviewing the "weight" given to languages within the Science education of classes already observed. Irrespective of the language spoken, the awareness of teachers on the language of Science (such as discourse genres and representational forms) is pivotal for innovating practices and developing a quality Science teaching methodology. From the point of view of authors devoted to CLIL, Science classes provide a lot of multimodal input supporting the understanding in a variety of manners. To put it differently, Science education itself and its languages may help CLIL planning and implementation of the articulation of Science with a FL. A new competence for teaching and learning Science through a foreign language should be thus accepted[22].

For the discussion[23] within this context, we can recall a diversity of studies and research on: Science languages and difficulties of learners with them (Halliday & Martin, 1993; Lemke, 2003; Lyon et al., 2012; Seah & Silver, 2018; Tang et al., 2014; Wellington & Osborne, 2001) as well as literacy practice aware of them (Espinet et al., 2012; Klein & Kirkpatrick, 2010; Pearson et al., 2010; Sanmartí, 2007; Yore & Treagust, 2006); Science literacy and contextualisation (Aikenhead, 2004; Martins, 2002; Rodrigues, 2016; R. M. Vieira et al., 2011); CLIL (Coyle et al., 2010; Dale & Tanner, 2012; Gajo, 2007; Llinares et al., 2012; Marsh, 2006; Marsh et al., 2011; Ramos-de Roble & Espinet, 2013); LAC (Vollmer, 2007).

The second research question was more focused on the CLIL approach used in the "English Plus" project: *What relationship exists between the presence of a second language (English) and the Science teaching and learning through the CLIL-EP programme?*[24]. Often CLIL is described as an

[22] Somehow also in line with the *Perfil dos Alunos à Saida da Escolaridade Obrigatória* (2017; for further information, https://www.dge.mec.pt/noticias/perfil-dos-alunos-saida-da-escolaridade-obrigatoria).

[23] References have been organised in this way, here, to avoid repeting the discussion sections relative to each of our published works, and to allow for answering research questions fluidly.

[24] It could be reformulated as *How does the Science teaching and learning through the CLIL-EP programme relate with the presence of English?*, because this research was designed as a case study also explanatory.

approach through which the specific Content is taught with the "side effect" of a higher proficiency in the Language (at school, rather than in private language centres). In the "English Plus" case, the "addition" of English in the teaching and learning of the specific subject and within the whole school project determines significant "side changes".

First of all, we note that the presence of a foreign language and the use of it to teach and learn a discipline leads to a more aware attitude among teachers who work and learn themselves for the development of such provision. Teachers diversify the input through a multimodal support (greater use of animations, visuals, audio, etc.)[25] in settings entailing a higher cognitive demand and resort to resources better capturing the learners' attention (for instance, game-based activities or a rap song on the borders of plate tectonics, which had an exemplary positive reaction among students). Facing scarce CLIL material and the fact that textbooks or resources for English native speakers are not always adequate for EP students, a leap of imagination is made by teachers, and content is treated and worked with extra care. Activities are thought of to engage the student who becomes central in the learning process, such as in the case of the participation in debates on scientific ideas and the preparation for structuring and presenting them, as well as of her/his involvement in the organisation of cinema sessions, school trips, among others. Furthermore, students' families and other organisations end up supporting the EP project and its activities/events, extending the learning process to the entire school community.

Having to teach using a foreign language, subject teachers show the need for knowing what to say and how to say it, alongside having pedagogical responsibilities, and notice the difficulty of learning scientific lexicon, "invisible" in non-project conditions. The experience with their own language difficulties, shared also with students, and the reflection on possible efforts required of learners seems to "break" the paradigm of knowledge transmission, forcing the innovation of practices, which can be beneficial also when the mother tongue is used (cf. Piacentini et al., 2019), because it is a matter of method or approach regardless of the language spoken, as one high school student also pointed out. The role that the English teacher undertakes during co-taught Science classes is to integrate the verbal subject representation by means of the paraphrasing of dense terms, labelling and drawing to visualise meanings and associations, that is, the use of Science languages within CLIL appears amplified. A methodology is gradually built up through these circumstances of integration, co-teaching and the different competence fields deployed. As remarked by participant teachers, this requires teacher teamwork and a

[25] Power Points (frequently used to communicate and share information) could extend Science languages, in being a multimodal tool which combines the verbal and visual languages and more forms.

collaborative environment also with students, and motivates teachers to change usual working directions and forge new learning possibilities.

With regards to the ex-EP students, the presence of English functions as a motivational factor creating positive learning conditions, due to the higher concentration needed when learning through a FL and demands a sort of mental exercise of discourse simplification that might structure (communication of the) knowledge and open up (content) understanding. English is not necessarily more difficult, as long as initial understanding difficulties are overcome, and evidence of this is disclosed by both teachers who observe and assess the learning and students of different ages. Here we are reminded that Portuguese students are exposed to English everyday outside the school walls, through Internet and online activities and television, non-dubbed movies and series, these last constituting a major difference between this context and Spain, Italy or France. For Portugal, a local bilingualism could be assumed or, at least, a "dual cultural identity" that might account for a motivation towards (learning with) English and some ease not detectable in a learner population of similar age in the other countries mentioned here. Also, foreign languages are considered very important for the professional sphere (emigration, use at work, etc.), in a considerably greater way than Science learning and learning through EP, which demands further clarification.

Another consequence of the project to highlight is the role given to strategies engaging learners at an oral level. Work presentations, participation in debates, being part of a play as well as working in groups and having different duties is a boost for an effective use of vocabulary and the development of an oral practice, which are fundamental for Science communication and argumentation. In general, the project time offers an additional opportunity to deepen Science topics and discuss Science issues (cf. Piacentini et al., 2016), and to promote the students' effective use of the language (here, English) and their communicative competence. Furthermore, as for the use of subtitles, while students are shown a video in English about a certain Science topic, the absence of them (in Portuguese) makes, in the teacher's opinion, the learner pay attention to the content of the video (in English), however, we consider that the presence of subtitles (in the same language as in the video) can improve both the knowledge of the (English) language in terms of oral and written skills and support the understanding of a (Science) topic, providing an extra language scaffold to learn through.

Moreover, "translanguaging" is advocated in CLIL and CLIL-like settings, but the use of a plurilingual repertoire is not encouraged by teachers during classes of the specific discipline with English, instead, it is an initiative or a necessity of students to, at times, speak "*Portugalês*" in

Science tests, within group works and to make sense to difficult processes, using the language in which a word, for example, can be imagined more easily or better (the native language, English or another FL). A “dialogic way” between the foreign language and the mother tongue, both shifting from colloquial to scientific ways of speaking and vice versa, is relevant. Therefore, being able to use different linguistic systems is a competence completing and favouring the understanding, and the development of which can contribute to empowering the self-concept of these learners as much as gaining a high English proficiency.

Among advantages from or the importance of aspects to achieve through participating in the “English Plus” project, there is no students’ reference to the insight into Science. Similarly, school documents do not present accomplishments in the learning of Science as an objective to attain or a developed competence. In defiance of these aspects, the experience of both teachers and students (who already mobilised at high school what they had learnt within EP) is that the approach adopted for the project involves a greater knowledge and a broader vision of Science as well as a better way to learn. On the other side, the mention of language and cultural diversity as well as the promotion of communication skills in English and of lifelong competences (citizenship, autonomy, etc.) is recurrent in observed and spoken practices. Although some of these are fundamental for scientific literacy, it seems that participants do not acknowledge the EP’s potential for enhancing the non-English discipline, here, Science education. Nevertheless, rather than English classes on Science topics, we understand a CLIL environment as subject classes, where the Science teacher herself plans, implements and changes practices of (Science) education, assuming an explicit language focus in it (cf. Piacentini et al., 2017).

The EP CLIL provision implies the learning of both Science-C and English-L (composite learning, the most represented category of importance among younger students). Most of the times the idea is that the EP project entails teaching/learning the discipline speaking another language (learning of Science in English and acquisition of scientific terms in English, matching with the frequent subject teacher’s need for having ample vocabulary translated). However, the concept of learning Science interwoven with English also exists – in terms of teaching attention devoted to both Content and Language, concepts and processes of C and L learnt at the same time, but also nature of knowledge resulting from the educational articulation of C and L – as also clear in the intersection and incorporation drawn by teachers, and in the older students’ experience. For them, it actually meant learning through the presence of English, through being part of the project itself and through having a rapport with teachers who learn themselves (cf. Piacentini et al., 2018).

It is worth realising that, in terms of high school options, Science was chosen by more than half of former EP students, whereas it only ranked an average position as favourite subject of current EP ones. Different reasons can be called to explain this, such as the teacher they had, changes occurred in their minds, but it might be an effect of having learnt through a "method" determining a different disposition towards Science. We would like to remark that 8th grade students, with a longer exposure to EP Science, preferred both Physics-Chemistry and Natural Sciences (three times) more than 7th graders. This aspect obviously needs more data (teaching method, syllabus, etc.) to be understood, but learning through the project could offer a positive experience with Science, which is crucial also taking into account that some students will not continue it after the 9th grade. On the other hand, "English Plus" Science education could be seen also as a space for students to get "closer" to local cultures in relation to international perspectives, providing "internationalisation at home" through a sort of "glocal" process that one teacher seemed to suggest and, thus, diminishing the conflation of English with English native countries and their traditions (cf. Piacentini & Simões, 2020).

As already seen within the context characterisation, other subject teachers are also involved in the "English Plus" project, though in a more spontaneous manner when compared to the timetable and teamwork officially devoted to Science (since 2014 onwards) and History (2010-2013). The EP project seems to have exceeded individual enthusiasms and to be fueled by a wider teacher community. Being referred to as a project, "English Plus" should be endorsed more and more as a programme and the school where it takes place and shape as a "learning institution" through the four components – people, processes, contexts and time – reinterpreted by Alarcão (2009). Further discussion should be opened on attempting to implement EP (or an approach aware about languages) also within the lab classes and only with the Science teacher, and on how to mitigate the "unsustainability" (time-consuming EP preparation, declared by teachers and observed by the researcher) of this provision.

The following authors[26] are relevant here, according to the research field: CLIL (Barbero, 2006; Coyle et al., 2010; Dale & Tanner, 2012; Gajo, 2007; Lasagabaster & Sierra, 2010; Marsh, 2006; Oattes et al., 2018; Pavón Vázquez & Ellison, 2013), CLIL Science (Blanchard et al., 2014; Canet Pladevall & Evnitskaya, 2011; Escobar Urmeneta & Evnitskaya, 2014; Grandinetti et al., 2013; Maldonado & Olivares, 2013; Valdés-Sánchez & Espinet, 2020) and translanguaging (Lin & Lo, 2017; Moore et al., 2018); internationalisation at home (Beleen & Jones, 2015); plurilingual and intercultural perspectives (Gajo, 2011; Fons, Simões, & Andrade, 2018; Pinho & Costa, 2018).

[26] See footnote n. 23.

Considerations about Science education and the English integration, that we have just drawn in answering our research questions, may be limited to the specificity of this CLIL-type EP school programme and the actors involved in the teaching and learning processes. However, empirical regularities associated with our case might be generalised to other populations that share essential features. After all, previous studies, and the spontaneous EP implementation by teachers of other areas at the local school, have shown that the educational articulation of the specific discipline with an addional language may work also for other subjects and other contexts, as long as a suitable school organisation exists and the school level is similar (as for the English proficiency and the specialisation of Content teaching). Actually, during the year of the empirical study, the EP Science project started with a similar format in another school of the District of Aveiro, and years after one school in another district sought a collaboration with our group for a new CLIL project.

Individually, published works we presented in the second chapter have their own limitations (for instance: work I requires a deeper literature review and derives from having grasped the context of practices rather than from observation focused systematically on classroom interactions; work II might be narrowed on the specific angle of plurilingual and intercultural competences, in relation to the other works; work IV is the first of our articles in being published and could present some naïve conclusions). Our research interfaces with diverse knowledge fields (language acquisition and motivational factors, Science education and the focus on language, English for non-native speakers, among others) and may display vulnerable points demanding further exploration.

Observation carried out during our inquiry focused on a relatively limited number of “English Plus” groups of students and their teachers. As already explained, the systematic observation of EP and non-EP settings in Science classes using the tool presented within results was not feasible. Therefore, its pilot was possible only during a few classes, which reduced possibility of adjustment and improvement. Furthermore, collaboration between teachers and researcher – who used to work together (both in person and off site) at least once per week – has decreased until the level of just email contact after the year of the study. This could have changed the angle from which we dealt with the case that we have described.

Finally, through her role of inquirer on the school EP programme and in being a foreigner in the Portuguese school system, the researcher could not avoid to immerse in and influence the context, to make sense of it through her own lenses. The Italian PhD student had the need for being accepted as a member of the team and in the school and to spend time to understand the

phenomenon. Having said that, the study was aligned with constructivist perspectives seeing researcher and her/his research as interwoven.

Further research is needed to characterise the suitability (or sustainability) of English[27] as a language and strategy/method for scaffolding Science learning. Also, a more focused observation of how knowledge construction is linked with language progression during Science classes (both using the mother tongue and the foreign language) is required. CLIL conditions represent a chance to investigate "connections"[28] between underpinnings and teaching practices implied in Science and the use of English vocabulary and language structures, in order to support the learning of Science through English and the practice of English through Science. Studying the relationship between research on (typically European) CLIL Science with English and that on Science education for English learners (typically, in English native countries) also demands further endeavour. On a different side, the understanding of how the cultures of English may be cultivated through Science can also be explored. The role of a foreign language in the awareness of one's own language and culture deserves more attention as well.

It will be also crucial to seek collaboration with participant teachers to understand if substantial practice changes, especially in terms of representational choices and language awareness for the (single) teaching of Science concepts and processes, have occurred as a consequence of having taught and learnt within the CLIL approach. A focus group or other supervising moments might be organised, aimed at understanding and promoting the use of Science languages (representation modalities as well as genres and relative discourse functions). The identification of teaching practice patterns in this methodological environment may allow for refining the instrument mentioned above and evaluating its feasibility. More effort is necessary to pinpoint factors that might serve the development of Science literacy also when the mother tongue is used. Similarly, there is a need for understanding to what extent these language considerations can work with different subject areas.

Opportunities of teacher professional development can be created and co-constructed with teachers, with the purpose of understanding, reflecting on and putting into practice the Language focus within Science education. CLIL competence areas added to the interview guide might be discussed with them. On a different level, the inclusion of a wider range of language and cultural

[27] During the PhD student's preparation for the thesis defense, conversation with colleagues working with Portuguese-speaking African countries (*PALOP*) raised the possibility of adapting the CLIL approach for supporting the promotion of local languages in these countries.

[28] An attempt of (re)formulation of the question corresponding to this point was provided in one of our papers: *How could teachers put Science and English "each in service of the other", in planning and implementing Science classes?* (cf. Piacentini, et al. 2019).

learning situations should be encouraged to promote plurilingual and intercultural experiences for students and the whole educational community, so that CLIL provision can constitute a solid context for an intercultural approach.

In relation to learners, new former students (those who will have completed the three-year "English Plus" of Science) might be excellent informants about effects in the learning of Science of having learnt through English and the project. It could be also interesting to understand how the participation in the project might affect the learners' attitude towards Science education and Science in general and future study choice in this area. Furthermore, we consider important the exploration of regulative documents at a national level (*Aprendizagens Essenciais*, *Metas Curriculares* and *Orientações Curriculares* of Physical and Natural Sciences at lower secondary instruction grades) as well as of textbooks, to identify concepts and contexts that, at the meso level of school and teacher subject plans (and, for reflection, assessment), can enable the cultivation of the Science languages and a more natural educational integration with English.

Our study tries to understand different aspects of Science education within conventional (non-project) conditions as well as qualitative effects of the integration of English into Science learning through the CLIL-type EP project settings. It shows that the CLIL approach entails a higher students' exposure to and improvement of English, which is used and learnt through the authentic practice during Science classes, and motivates students to and, to some extent, facilitates the specific learning. However, the most remarkable contribution to reveal is that, due to having an explicit presence of language (the foreign one), CLIL settings make teachers become aware of the difficulties that students have to confront in learning a discipline through an additional language; they thus resort to alternative and interesting resources and develop practices more centred on learners.

In other words, they learn to teach better and, in doing so, they seem to perceive the existence of Science languages, at least in terms of lexicon density, potential of and need for visualisation as well as discourse construction in different processes. CLIL revealed itself to be a method-driving context which opens a possibility for teachers to develop a language-focused Science education, and for researchers to reflect on and orientate teaching methodologies towards a "SCIL" direction (Science Constructed through the Integration of its Languages). Hence, CLIL underpinnings and implications could be beneficial for, and integrated into, the subject-specific education also when teachers and students are working with their native language, that is, a CMIL – now, Integrated Learning of Content with a focus on language, while using the Mother tongue as the mean of communication – approach/context is pivotal to revise Science educational practices, through

teaching in the languages of Science as much as how to use them. Provocatively, teacher education based on CMIL could mean, on one hand, to "equip" teachers with competences to "rethink" their own strategies, on the other hand, to ensure that more students can benefit from learning through a project-like approach.

At a macro European and non-European level, the present work contributes to extending research on practice in CLIL Science with English. It is then an example of research where different knowledge fields have converged. Though not being a longitudinal study, it constitutes a holistic view interweaving participants with different educational roles and involved in different times throughout the project implementation. With regards to the micro learning environment under study, the understanding/description of how the knowledge on and learning of Science might be enhanced by the English presence likely moves CLIL research forward and contributes to that on Science education.

Research carried out through this PhD represents also a fundamental contribution to the Portuguese both academic and general context, in terms of understanding constructed about CLIL knowledge and provision, relationship established with teachers, boost of studies on lower secondary school level, increase in doctoral theses, and, also when accounting for our published works, international visibility of the Portuguese CLIL research. Moreover, different interventions (piece in *Diário de Aveiro*, SciComPT '19, training course on CLIL, 2018 FameLab in Aveiro, SCoRE|17, among others) have "Opened Science" to a broader community. Not least, we consider that the perspective of an Italian "making the familiar strange" in the Portuguese (school) system allowed for significant insight of the inquired phenomenon.

REFERENCES

These references have been mentioned throughout the text of the present thesis document. For consultation of the references to the studies or authors used within the second chapter, see each published work.

Aikenhead, G. S. (2004). The Humanistic and Cultural aspects of Science & Technology education. In Public Awareness Education Programs of the Sciences & Humanities – Technology & Global Bioethics (PAEP), *11th International Organization for Science and Technology Education (IOSTE) Symposium*. Lublin.

Alarcão, I. (2009). Desenvolvimento a três dimensões: curricular, profissional e institucional. Reflexões sobre um caso real. *Indagatio Didactica - Desenvolvimento Curricular e Didáctica*, *1*(1), 8–31. Retrieved from https://proa.ua.pt/index.php/id/article/view/4568/3477

Baetens Beardsmore, H. (2008). Multilingualism, Cognition and Creativity. *International CLIL Research Journal*, *1*(1), 4–19. Retrieved from https://www.unifg.it/sites/default/files/allegatiparagrafo/17-12-2014/baetens_beardsmore_multilingualism_cognition_and_creativity.pdf

Barbero, T. (2006). Insegnare in lingua straniera: quali sfide? Quali difficoltà. In C. M. Coonan (Ed.), *CLIL: un nuovo ambiente di apprendimento. Sviluppi e riflessioni sull'uso veicolare di una lingua seconda/straniera. Venezia, settembre 2004* (pp. 105–117). Venezia: Libreria Editrice Cafoscarina.

Baxter, P., & Jack, S. (2008). Qualitative case study methodology: Study design and implementation for novice researchers. *The Qualitative Report*, *13*(4), 544–559. Retrieved from https://nsuworks.nova.edu/tqr/vol13/iss4/2

Beacco, J.-C., Byram, M., Cavalli, M., Coste, D., Cuenat, M. E., Goullier, F., & Panthier, J. (2010). *Guide for the development and implementation of curricula for plurilingual and intercultural education*. Strasbourg. Retrieved from http://www.coe.int/t/dg4/linguistic/Publications_en.asp

Beleen, J., & Jones, E. (2015). Redefining Internationalization at Home. In A. Curaj, L. Matei, R. Pricopie, J. Salmi, & P. Scott (Eds.), *The European Higher Education area. Between critical reflections and future policies* (pp. 59–72). Cham: Springer.

Bertaux, P., Coonan, C. M., Frigols-Martín, M. J., & Mehisto, P. (2010). *The CLIL teacher's competences Grid*. Retrieved from http://tplusm.net/CLIL_Competences_Grid_31.12.09.pdf

Blanchard, B., Masserot, V., & Holbrook, J. (2014). The PROFILES project promoting science teaching in a foreign language. *Science Education International*, *25*(2), 78–96. Retrieved from https://eric.ed.gov/?id=EJ1032970

Bruton, A. (2013). CLIL: Some of the reasons why… and why not. *System*, *41*(3), 587-597. https://doi.org/10.1016/j.system.2013.07.001

Bryman, A. (2012). *Social Research Methods* (Fourth Edition). New York: Oxford University Press Inc.

Bunch, G. C., Shaw, J. M., & Geaney, E. R. (2010). Documenting the language demands of mainstream content-area assessment for English learners: participant structures, communicative modes and genre in science performance assessments. *Language and Education*, *24*(3), 185–214. https://doi.org/10.1080/09500780903518986

Buxton, C. A., & Lee, O. (2014). English Learners in Science education. In N. G. Lederman & S. K. Abell (Eds.), *Handbook of Research on Science Education Volume II* (pp. 204–222). New York: Routledge.

Cabello, V. M., Salinas Barrios, I., & Geelan, D. (2019). Practitioner learning in the intersections between Science and Language. *Research in Science Education*, *49*(4), 949–957. https://doi.org/10.1007/s11165-019-09866-0

Canet Pladevall, R., & Evnitskaya, N. (2011). Rethink, rewrite, remake, or learning to teach science through English. In C. Escobar Urmeneta, N. Evnitskaya, E. Moore, & A. Patiño (Eds.), *AICLE – CLIL – EMILE: Educació plurilingüe. Experiencias, research & polítiques* (pp. 167–177). Bellaterra: Servei de Publicacions de la Universitat Autònoma de Barcelona.

Cenoz, J. (2015). Content-based instruction and content and language integrated learning: the same or different? *Language, Culture and Curriculum*, *28*(1), 8–24. https://doi.org/10.1080/07908318.2014.1000922

Cho, J. Y., & Lee, E. (2014). Reducing confusion about Grounded Theory and Qualitative Content Analysis: Similarities and Differences. *The Qualitative Report, 19*(32), 1-20. Retrieved from http://nsuworks.nova.edu/tqr/vol19/iss32/2

Clegg, J. (2007). Analysing the Language Demands of lessons taught in a second language. *Revista Española de Lingüística Aplicada*, *1*, 113–128. Retrieved from https://dialnet.unirioja.es/servlet/articulo?codigo=2575499

Cohen, L., Manion, L., & Morrison, K. (2000). *Research Methods in Education*. *Routledge Falmer (Fifth).* London and New York: Routledge Falmer - Taylor & Francis Group.

Council of Europe. (2001). *Common European Framework of Reference for Languages: Learning, Teaching, Assessment (CEFR)*. Strasbourg. Retrieved from https://www.coe.int/en/web/common-european-framework-reference-languages

Coyle, D. (2005). CLIL Planning tools for Teachers. England. Retrieved from https://www.unifg.it/sites/default/files/allegatiparagrafo/20-01-2014/coyle_clil_planningtool_kit.pdf

Coyle, D. (2013). Listening to learners: An investigation into "successful learning" across CLIL contexts. *International Journal of Bilingual Education and Bilingualism*, *16*(3), 244–266. https://doi.org/10.1080/13670050.2013.777384

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

Creswell, J. W. (2003). *Research Design. Qualitative, Quantitative, and mixed methods approaches*. *SAGE Publications* (Second). London - Thousand Oaks - New Delhi: SAGE Publications Ltd.

Cummins, J. (1987). Bilingualism, language proficiency and metalinguistic development. In P. Homel, M. Palji, & D. Aaronson (Eds.), *Childhood Bilingualism: Aspects of Linguistic, Cognitive and Social Development* (pp. 57–73). Hillsdale, N. J.: Erlbaum.

Dale, L., & Tanner, R. (2012). *CLIL acitivities. A resource for subject and language teachers*. Cambridge: Cambridge University Press.

Dallinger, S., Jonkmann, K., Hollm, J., & Fiege, C. (2016). The effect of content and language integrated learning on students' English and history competences – Killing two birds with one stone? *Learning and Instruction*, *41*(1), 23–31. https://doi.org/doi.org/10.1016/j.learninstruc.2015.09.003

Dalton-Puffer, C. (2007). *Discourse in Content and Language Integrated Learning (CLIL) classrooms*. Amsterdam: John Benjamins Publishing. https://doi.org/10.1075/lllt.20

Dalton-Puffer, C. (2011). Content-and-Language Integrated Learning: From Practice to Principles? *Annual Review of Applied Linguistics*, *31*, 182–204. https://doi.org/10.1017/S0267190511000092

Dalton-Puffer, C., & Nikula, T. (2006). Pragmatics of content-based instruction: Teacher and Student Directives in Finnish and Austrian Classrooms. *Applied Linguistics*, *27*(2), 241–267. https://doi.org/10.1093/applin/aml007

Dearden, J. (2014). *English as a medium of instruction – a growing global phenomenon*. Retrieved from

https://www.britishcouncil.org/education/ihe/knowledge-centre/english-language-higher-education/report-english-medium-instruction

Dörnyei, Z. (1998). Motivation in second and foreign language learning. *Language Teaching*, *31*(3), 117–135. https://doi.org/https://doi.org/10.1017/S026144480001315X

Duit, R. (2007). Science education research internationally: Conceptions, research methods, domains of research. *Eurasia Journal of Mathematics, Science & Technology Education*, *3*(1), 3–15. https://doi.org/10.12973/ejmste/75369

Ellison, M. (2018). (Net)Working CLIL in Portugal. *E-TEALS*, *9*(s1), 4–22. https://doi.org/10.2478/eteals-2018-0010

Ellison, M., & Santos, Á. A. (2018). Implementing CLIL in Schools: The Case of the GoCLIL Project in Portugal. *E-TEALS*, *8*(1), 43–72. https://doi.org/10.2478/eteals-2018-0003

Erickson, F. (1984). What Makes School Ethnography 'Ethnographic'? *Anthropology & Education Quarterly*, *15*(1), 51–66. https://doi.org/10.1525/aeq.1984.15.1.05x1472p

Escobar Urmeneta, C. (2013). Learning to become a CLIL teacher: teaching, reflection and professional development. *International Journal of Bilingual Education and Bilingualism*, *16*(3), 334–353. https://doi.org/10.1080/13670050.2013.777389

Escobar Urmeneta, C., & Evnitskaya, N. (2014). 'Do you know Actimel?' The adaptive nature of dialogic teacher-led discussions in the CLIL science classroom: a case study. *The Language Learning Journal*, *42*(2), 165–180. https://doi.org/10.1080/09571736.2014.889507

Escobar Urmeneta, C., & Sánchez Sola, A. (2009). Language learning through tasks in a Content and Language Integrated Learning (CLIL) Science Classroom. *Porta Linguarum*, *11*, 65–83. Retrieved from http://hdl.handle.net/10481/31835

Espinet, M., Izquierdo, M., Bonil, J., & Ramos-de Robles, S. L. (2012). The role of Language in modeling the natural world: Perspectives in Science education. In B. J. Fraser, K. Tobin, & C. J. McRobbie (Eds.), *Second International Handbook of Science Education* (pp. 1385–1403). Dordrecht: Springer.

Espinet, M., Valdés-Sánchez, L., Carrillo, N., Farró, L., Martínez, R., López, N., & Castillón, A. (2017). Promoting the integration of inquiry based Science and English learning in primary education through triadic Partnerships. In A. W. Oliveira & M. H. Weinburgh (Eds.), *Science teacher preparation in Content-based second Language acquisition* (pp. 287-303). Dordrecht: Springer.

European Commission. (2003). *Promoting Language Learning and Linguistic Diversity: An Action Plan 2004 – 2006*. Bruxelles. Retrieved from https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2003:0449:FIN:EN:PDF

European Commission. (2006). *Content and Language Integrated Learning (CLIL) at School in Europe*. Brussels. Retrieved from https://publications.europa.eu/en/publication-detail/-/publication/6c4f8444-814b-494d-a346-b1627ce276cc

European Commission. (2011). *Civil Society Platform on Multilingualism*. Brussels. Retrieved from https://elen.ngo/wp-content/uploads/2016/05/report-civil-society_en.pdf

European Commission. (2017). *Key Data on Teaching Languages at School in Europe – 2017*. Brussels. https://doi.org/10.2797/12061

Evnitskaya, N., & Morton, T. (2011). Knowledge construction, meaning-making and interaction in CLIL science classroom communities of practice. *Language and Education*, *25*(2), 109–127. https://doi.org/10.1080/09500782.2010.547199

Fiedler, S. (2011). English as a lingua franca – a native-culture-free cose? Language of communication vs. language of identification. *Apples – Journal of Applied Language Studies*, *5*(3), 79–97.

Retrieved from http://apples.jyu.fi/article_files/Fiedler_final.pdf

Flick, U. (2009). *An Introduction To Qualitative Research (Fourth).* London - Thousand Oaks - New Delhi - Singapore: SAGE Publications Ltd.

Fons, M., Simões, A. R., & Andrade, A. I. (2018). La construcción de la identidad: las historias de vida linguísticas. In C. Helmchen & S. Melo-Pfeiffer (Eds.), *Plurilingual Literary Practices at school and in teacher education* (pp. 63–78). Berlin: Peter Lang.

Gajo, L. (2007). Linguistic knowledge and subject knowledge: How does Bilingualism contribute to subject development? *International Journal of Bilingual Education and Bilingualism*, *10*(5), 563–581. https://doi.org/10.2167/beb460.0

Gajo, L. (2011). Trabajar en otra lengua para elaborar saberes en una disciplina. In C. E. Urmeneta & L. Nussbaum (Eds.), *Aprendre en uma altra llengua Learning through another language Aprender en otra lengua* (pp. 53–70). Barcelona: Universitat Autònoma de Barcelona.

Gardner, R. C., & MacIntyre, P. D. (1993). A student's contributions to second-language learning. Part II: Affective variables. *Language Teaching*, *26*, 1–11. https://doi.org/https://doi.org/10.1017/S0261444800000045

Gimeno, A., Seiz, R., de Siqueira, J. M., & Martínez, A. (2010). Content and language integrated learning in higher technical education using the inGenio online multimedia authoring tool. *Procedia - Social and Behavioral Sciences*, *2*(2010), 3170–3174. https://doi.org/10.1016/j.sbspro.2010.03.484

Grandinetti, M., Langellotti, M., & Ting, Y.-L. T. (2013). How CLIL can provide a pragmatic means to renovate science education – even in a sub-optimally bilingual context. *International Journal of Bilingual Education and Bilingualism*, *16*(3), 354–374. https://doi.org/10.1080/13670050.2013.777390

Guba, E. G., & Lincoln, Y. S. (1994). Competing Paradigms in Qualitative Research. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 105–117). Thousand Oaks, CA: SAGE.

Halliday, M. A. K. (1993). Towards a language-based theory of learning. *Linguistics and Education*, *5*(2), 93–116. https://doi.org/10.1016/0898-5898(93)90026-7

Halliday, M. A. K., & Martin, J. R. (1993). *Writing Science: Literacy and Discursive Power*. Bristol/London: The Falmer Press.

Holbrook, J., & Rannikmae, M. (2009). The meaning of scientific literacy. *International Journal of Environmental & Science Education*, *4*(3), 275–288. Retrieved from http://www.ijese.net/makale/1394

Hsieh, H.-F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research*, *15*(9), 1277–1288. https://doi.org/10.1177/1049732305276687

Hurd, P. D. (1998). Scientific literacy: New minds for a changing world. *Science Education*, *82*(3), 407–416. https://doi.org/10.1002/(SICI)1098-237X(199806)82:3<407::AID-SCE6>3.0.CO;2-G

Jäppinen, A.-K. (2005). Thinking and Content Learning of Mathematics and Science as Cognitional Development in Content and Language Integrated Learning (CLIL): Teaching Through a Foreign Language in Finland. *Language and Education*, *19*(2), 148–169. https://doi.org/10.1080/09500780508668671

Jenkins, J. (2015). Repositioning English and multilingualism in English as a Lingua Franca. *Englishes in Practice*, *2*(3), 49–85. https://doi.org/10.1515/eip-2015-0003

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed Methods Research : A Research Paradigm Whose Time Has Come. *Educational Researcher*, *33*(7), 14–26. https://doi.org/10.3102/0013189X033007014

Kaire, S. (2017). We are on the same boat, but still I am from another culture: the lived experiences of learning in groups. *Encyclopaideia*, *21*(47), 29–48. https://doi.org/10.6092/issn.1825-8670/6946

Kamoen, N., Holleman, B., van den Bergh, H., & Sanders, T. (2013). Positive, negative, and bipolar questions: The effect of question polarity on ratings of text readability. *Survey Research Methods*, *7*(3), 181–189. https://doi.org/https://doi.ohttps://doi.org/10.18148/srm/2013.v7i3.5034

Kiraz, A., Güneyli, A., Baysen, E., Gündüz, Ş., & Baysen, F. (2010). Effect of science and technology learning with foreign langauge on the attitude and success of students. *Procedia - Social and Behavioral Sciences*, *2*(2), 4130–4136. https://doi.org/10.1016/j.sbspro.2010.03.652

Klein, P. D., & Kirkpatrick, L. C. (2010). Multimodal literacies in science: Currency, coherence and focus. *Research in Science Education*, *40*(1), 87–92. https://doi.org/10.1007/s11165-009-9159-4

Koller, O., Leucht, M., & Pant, H. A. (2012). Effekte bilingualen Unterrichts auf die Englisch-leitstungen in der Sekundarsufe / Effects of Bilingual Instruction on English Achievement in Lower Secondary Schools. *Unterrichtswissenschaft*, *40*(4), 334–350. Retrieved from http://pure.ipn.uni-kiel.de/portal/en/publications/effekte-bilingualen-unterrichts-auf-die-englischleistungen-in-der-sekundarstufe-i(285a9716-886a-4089-b3ae-a253e2d86284).html

Lasagabaster, D., & Sierra, J. M. (2010). Immersion and CLIL in English: more differences than similarities. *ELT Journal*, *64*(4), 367–375. https://doi.org/10.1093/elt/ccp082

Lemke, J. (2003). *Teaching all the languages of Science: Words, symbols, images, and actions*. Retrieved from www.jaylemke.com/science-education/

Lin, A. M. Y. (2016). *Language Across the Curriculum & CLIL in English as an Additional Language (EAL) Contexts*. Singapore: Springer.

Lin, A. M. Y., & Lo, Y. Y. (2017). Trans/languaging and the triadic dialogue in content and language integrated learning (CLIL) classrooms. *Language and Education*, *31*(1), 26–45. https://doi.org/10.1080/09500782.2016.1230125

Llinares, A., Morton, T., & Whittaker, R. (2012). *The Role of Language in CLIL*. Cambridge: Cambridge University Press.

Lodico, M. G., Spaulding, D. T., & Voegtle, K. H. (2006). *Methods in Educational Research. From theory to practice*. *Jossey-Bass A Wiley Imprint*. San Francisco, CA: John Wiley & Sons, Inc.

Lopes, B., Pedrosa-de-Jesus, H., & Watts, M. (2016). The old questions are the best: Striving against invalidity in qualitative research. In J. Huisman & M. Tight (Eds.), *Theory and Method in Higher Education Research Volume 2* (pp. 1–22). Bingley, UK: Emerald Books.

Lourenço, M., & Mourão, S. (2017). Learning English (and other languages) in Portugal. *Language Issues*, *28*(2), 53–55. Retrieved from www.researchgate.net/profile/Monica_Lourenco/publication/322722503_Learning_English_and_other_languages_in_Portugal/links/5a6b5088458515b2d055a50f/Learning-English-and-other-languages-in-Portugal.pdf

Lyon, E. G., Bunch, G. C., & Shaw, J. M. (2012). Navigating the language demands of an inquiry-based science performance assessment: Classroom challenges and opportunities for English learners. *Science Education*, *96*(4), 631–651. https://doi.org/10.1002/sce.21008

Maldonado, N., & Olivares, P. (2013). Ensenyar ciències en anglès. La superació d'un triple repte. *Temps d'educació*, *45*, 17–39. Retrieved from www.publicacions.ub.edu/revistes/tempsDEducacio45/default.asp?articulo=935&modo=resumen

Mariotti, C. (2006). Negotiated interactions and repair patterns in CLIL settings. *VIEWS*, *15*(3), 33–39.

Retrieved from blocs.xtec.cat/clilpractiques1/files/2008/12/views15_3_clil_special.pdf#page=33

Marsh, D., & Langé, G. (Eds.). (2000). *Using Languages to Learn and Learning to Use Languages*. Jyväskylä: University of Jyväskylä. Retrieved from https://archive.ecml.at/mtp2/CLILmatrix/pdf/1UK.pdf%0A%0A

Marsh, D. (2002). CLIL/EMILE – the European dimension: Action, trends and foresight potential. Jyväskylä: University of Jyväskylä. Retrieved from https://jyx.jyu.fi/handle/123456789/47616

Marsh, D. (2006). English as medium of instruction in the new global linguistic order: Global characteristics, local consequences. In *Second Annual Conference for Middle East Teachers of Science, Mathematics and Computing* (pp. 29–38). Abu Dhabi: METSMaC.

Marsh, D. (2012). *Content and Language Integrated Learning (CLIL). A development trajectory*. Cordoba: Servicio de Publicaciones de la Universidad de Córdoba.

Marsh, D, Mehisto, P., Wolff, D., & Frigols Martín, M. J. (2011). European Framework for CLIL Teacher Education. *Language Teaching*. Graz: European Centre for Modern Languages. https://doi.org/10.1017/S0261444811000243

Martins, I. P. (2002). Das potencialidades da Educação em Ciências nos primeiros anos aos desafios da Educação Global. In D. Universidade de Aveiro (Ed.), *Educação e Educação em Ciências* (pp. 29–46). Aveiro: Tipografia Minerva Central, Lda.

Martins, I. P. (2014). Políticas Públicas e Formação de Professores em Educação CTS. *Uni-Pluri/Versidad*, *14*(2), 50–62. Retrieved from http://aia-cts.web.ua.pt/artigo.pdf

Mayring, P. (2014). *Qualitative content analysis. Theoretical foundation, basic procedures and software Solution*. Klagenfurt: Gesis. Retrieved from http://nbn-resolving.de/urn:nbn:de:0168-ssoar-395173

Mehisto, P. (2012). Criteria for producing CLIL learning material. *Encuentro*, *21*, 15–33. Retrieved from http://files.eric.ed.gov/fulltext/ED539729.pdf

Merriam, S. B. (1995). What can you tell from a N of 1?: Issues of validity and realibility in qualitative research. *PAACE Journal of Lifelong Learning*, *4*, 51–60. Retrieved from https://steinhardtapps.es.its.nyu.edu/create/courses/3311/reading/9-Merriam1995.pdf

Merriam, S. B. (1998). *Qualitative research and case study applications in education*. San Francisco, CA: Jossey-Bass.

Meyer, O., Coyle, D., Halbach, A., Schuck, K., & Ting, T. (2015). A pluriliteracies approach to content and language integrated learning – mapping learner progressions in knowledge construction and meaning-making. *Language, Culture and Curriculum*, *28*(1), 41–57. https://doi.org/10.1080/07908318.2014.1000924

Meyerhöffer, N., & Dreesmann, D. C. (2019). The exclusive language of science? Comparing knowledge gains and motivation in English-bilingual biology lessons between non-selected and preselected classes. *International Journal of Science Education*, *41*(1), 1–20. https://doi.org/10.1080/09500693.2018.1529446

Milton, J., & Meara, P. (1998). Are the British really bad at learning foreign languages? *Language Learning Journal*, *18*(1), 68–76. https://doi.org/10.1080/09571739885200291

Moore, E., Evnitskaya, N., & Ramos-de Robles, S. L. (2018). Teaching and learning science in linguistically diverse classrooms. *Cultural Studies of Science Education*, *13*(2), 341–352. https://doi.org/10.1007/s11422-016-9783-z

Mortimer, E. F., & Scott, P. H. (2003). *Meaning Making in Secondary Science Classrooms*. Maidenhead: Open University Press.

Muñoz, C. (2002). Relevance and potential of CLIL. In D. Marsh (Ed.), *CLIL/EMILE – the European*

dimension: Action, trends and foresight potential (pp. 33–34. Jyväskylä: University of Jyväskylä. Retrieved from https://jyx.jyu.fi/handle/123456789/47616

Nikula, T. (2015). Hands-on tasks in CLIL science classrooms as sites for subject-specific language use and learning. *System*, *54*(2015), 14–27. https://doi.org/10.1016/j.system.2015.04.003

Nikula, T., Dalton-Puffer, C., & Llinares, A. (2013). CLIL classroom discourse. Research from Europe. *Journal of Immersion and Content-Based Language*, *1*(1), 70–100. https://doi.org/10.1075/jicb.1.1.04nik

Oattes, H., Oostdam, R., de Graaff, R., & Wilschut, A. (2018). The challenge of balancing content and language: Perceptions of Dutch bilingual education history teachers. *Teaching and Teacher Education*, *70*, 165–174. https://doi.org/10.1016/j.tate.2017.11.022

Pavón Vázquez, V., & Ellison, M. (2013). Examining teacher roles and competences in Content and Language Integrated Learning (CLIL). *Lingvarvm Arena*, *4*, 65–78. Retrieved from http://ler.letras.up.pt/uploads/ficheiros/12007.pdf

Pearson, P. D., Moje, E., & Greenleaf, C. (2010). Literacy and Science: Each in the Service of the Other. *Science*, *328*, 459–463. https://doi.org/10.1126/science.1182595

Pérez-Cañado, M. L. (2012). CLIL research in Europe: past, present, and future. *International Journal of Bilingual Education and Bilingualism*, *15*(3), 315–341. https://doi.org/10.1080/13670050.2011.630064

Pérez Cañado, M. L. (2016). Are teachers ready for CLIL? Evidence from a European study. *European Journal of Teacher Education*, *39*(2), 202–221. https://doi.org/10.1080/02619768.2016.1138104

Piacentini, V., & Simões, A. R. (2020). CLIL: a way to develop plurilingual and intercultural competences in schools? In F. Anastassiou & G. Andreou (Eds.), *English as a foreign language: Perspectives on teaching, multilingualism and interculturalism* (pp. 54–83). Cambridge: Cambridge Scholars Publishing.

Piacentini, V., Simões, A. R., & Vieira, R. M. (2016). Abordagem holística no sistema educativo português para desenvolver a(s) Literacia(s) das Ciências integradas com o Inglês / Holistic approach in the Portuguese education system to develop Literacies of Science integrated with English. *Indagatio Didactica*, *8*(1), 1975–1992. Retrieved from http://revistas.ua.pt/index.php/ID/article/view/3981/3663

Piacentini, V., Simões, A. R., & Vieira, R. M. (2017). The language focus of Science education integrated with English learning. *Enseñanza de Las Ciencias*, *Extra*(2017), 399–404. Retrieved from https://ddd.uab.cat/record/184622

Piacentini, V., Simões, A. R., & Vieira, R. M. (2018). What students tell teachers about practices that integrate Subjects with English in a lower secondary school in Portugal. *E-TEALS*, *9*(s1), 57–76. https://doi.org/10.2478/eteals-2018-0013

Piacentini, V., Simões, A. R., & Vieira, R. M. (2019). Teachers' view of Language(s) in (CLIL) Science education: A case study in Portugal. *Problems of Education in the 21st Century*, *77*(5), 636–649. https://doi.org/10.33225/pec/19.77.636

Pinho, A. S., & Costa, A. M. (2018). Educação intercultural e ensino de inglês no 3º Ciclo do Ensino Básico. In F. H. Veiga (Ed.), *O ensino na escola de hoje - teoria, investigação e aplicação* (pp. 383-413). Lisboa: Climepsi Editores.

Ramos-de Robles, S. L., & Espinet, M. (2013). Expanded agency in multilingual Science teacher training classrooms. In N. Mansour & R. Wegerif (Eds.), *Science and Education for Diversity. Theory and Practice* (pp. 251–271). Dordrecht: Springer.

Roberts, D. A., & Bybee, R. W. (2014). Scientific Literacy, Science Literacy, and Science Education. In N.

G. Lederman & S. K. Abell (Eds.), *Handbook of Research on Science Education Volume II* (pp. 545–558). New York: Routledge.

Rodrigues, A. V. (2016). *Perspetiva Integrada de Educação em Ciências. Da teoria à prática*. Aveiro: UA Editora.

Roslan, R., Panjang, S. M., Yusof, N., & Shahrill, M. (2018). Teacher's feedback in teaching science in a bilingual Bruneian primary classroom. *On the Horizon*, *26*(2), 122–136. https://doi.org/10.1108/OTH-09-2017-0080

Roth, W.-M. (2007). Toward a dialectical notion and praxis of scientific literacy. *Journal of Curriculum Studies*, *39*(4), 377–398. https://doi.org/10.1080/00220270601032025

Sanmartí, N. (2007). Hablar, leer y escribir para aprender ciencia. In P. Fernández (Ed.), *La competencia en comunicación lingüística en las áreas del currículo* (pp. 103–128). Madrid: MEC.

Sanmartí, N., & Oliveras, B. (2011). Llegir per aprendre i per desenvolupar el pensament crític: reflexions des de l'aprenentatge de les ciències. In C. Escobar Urmeneta & L. Nussbaum (Eds.), *Aprendre en uma altra llengua Learning through another language Aprender en otra lengua* (pp. 71–87). Barcelona: Universitat Autònoma de Barcelona.

Schreiner, C., & Sjøberg, S. (2004). Sowing the seeds of ROSE. Background, rationale, questionnaire development and data collection for ROSE (the Relevance Of Science Education) – a comparative study of students' views of science and science education. In *Acta Didactica 4*. University of Oslo: Department of Teacher Education and School Development.

Scott, P. H., Mortimer, E. F., & Aguiar, O. G. (2006). The tension between authoritative and dialogic discourse: A fundamental characteristic of meaning making interactions in high school science lessons. *Science Education*, *90*(4), 605–631. https://doi.org/10.1002/sce.20131

Seah, L. H., & Silver, R. E. (2018). Attending to science language demands in multilingual classrooms: a case study. *International Journal of Science Education*, 1–19. https://doi.org/10.1080/09500693.2018.1504177

Simões, A. R., & Araújo e Sá, M. H. (2013). Reflexões em torno dos resultados de um inquérito por questionário aplicado no distrito de Aveiro. *Revista Lusófona de Educação*, *23*(23), 137–158. Retrieved from https://revistas.ulusofona.pt/index.php/rleducacao/article/view/3358

Simões, A. R., Pinho, S. A., Costa, M. A., & Costa, R. A. (2013). The Project English Plus: a CLIL approach in a Portuguese school. *Indagatio Didatica*, *5*(4), 30–51. Retrieved from http://revistas.ua.pt/index.php/ID/article/viewFile/2565/2430

Smokotin, V. M., Alekseyenko, A. S., & Petrova, G. I. (2014). The phenomenon of linguistic globalization: English as the Global Lingua Franca (EGLF). *Procedia - Social and Behavioral Sciences*, *154*(2014), 509–513. https://doi.org/10.1016/j.sbspro.2014.10.177

Stake, R. E. (1994). Case Studies. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of Qualitative Research* (pp. 236–247). Thousand Oaks, CA: SAGE.

Suryani, A. (2008). Comparing Case Study and Ethnography as Qualitative Research Approaches. *Jurnal Ilmu Komunikasi*, *5*(1), 117–127. Retrieved from http://ojs.uajy.ac.id/index.php/jik/article/view/221

Tang, K.-S., Delgado, C., & Moje, E. B. (2014). An integrative framework for the analysis of multiple and multimodal representations for meaning-making in science education. *Science Education*, *98*(2), 305–326. https://doi.org/10.1002/sce.21099

Tenreiro Vieira, C., & Vieira, R. M. (2014). *Construindo práticas didático-pedagógicas promotoras da literacia e do pensamento crítico*. *Documentos de Trabajo n. 2*. Madrid: IBERCIENCIA. Retrieved from https://www.oei.es/historico/divulgacioncientifica/?Construindo-praticas-didatico

Ting, Y.-L. T. (2010). CLIL Appeals to How the Brain Likes Its Information: Examples From CLIL-(Neuro)Science. *International CLIL Research Journal*, *1*(3), 3–18. Retrieved from http://www.icrj.eu/13/article1.html

Tsang, E. W. K. (1998). Inside story: Mind your identity when conducting cross national research. *Organization Studies*, *19*(3), 511–515. https://doi.org/10.1177/017084069801900307

Tsang, E. W. K. (2014). Generalizing from Research Findings: The Merits of Case Studies. *International Journal of Management Reviews*, *16*(4), 369–383. https://doi.org/10.1111/ijmr.12024

Tsang, K. K. (2012). The use of midpoints in Likert scale: The implications for educational research. *Honk Kong Teachers' Centre Journal*, *11*(1), 121–130. Retrieved from https://www.edb.org.hk/HKTC/download/journal/j11/HKTCJv11_11-B02.pdf

Tuan, H., Chin, C., & Shieh, S. (2005). The development of a questionnaire to measure students' motivation towards science learning. *International Journal of Science Education*, *27*(6), 639–654. https://doi.org/10.1080/0950069042000323737

Valdés-Sánchez, L., & Espinet, M. (2020). Coteaching in a science-CLIL classroom: Changes in discursive interaction as evidence of an English teacher's science-CLIL professional identity development. *International Journal of Science Education*, 1-27. https://doi.org/10.1080/09500693.2019.1710873

Vieira, F., Moreira, M. A., & Peralta, H. (2014). Research in foreign language education in Portugal (2006–2011): Its transformative potential. *Language Teaching*, *47*(2), 191–227. https://doi.org/10.1017/S0261444813000529

Vieira, R. M., Tenreiro-Vieira, C., & Martins, I. P. (2011). *A Educação em Ciências com Orientação CTS. Atividades para o ensino básico*. Porto: Areal Editores.

Vollmer, H. J. (2007). Language across the curriculum: A way towards plurilingualism. In W. Martyniuk (Ed.), *Towards a common European framework of reference for languages of school education* (pp. 177–192). Krakow: Universität Osnabrück. Retrieved from https://universitas.com.pl/media/File/Fragmenty/TOWARDS/mart_2-3.pdf

Wellington, J., & Osborne, J. (2001). *Language and Literacy in Science Education*. Buckingam/Philadephia: Open University Press.

White, J., Drew, S., & Hay, T. (2009). Ethnography versus Case Study. Positioning Research and Researchers. *Qualitative Research Journal*, *9*(1), 18–27. https://doi.org/10.3316/QRJ0901018

Willis, J. W. (2007). *Foundations of qualitative research: interpretive and critical approaches*. Thousand Oaks, CA: SAGE.

Wolff, D. (2012). The European framework for CLIL teacher education. *Synergies Italie*, (8), 105–116. Retrieved from http://gerflint.fr/Base/Italie8/dieter_wolff.pdf

Xanthou, M. (2011). The impact of CLIL on L2 vocabulary development and content knowledge. *English Teaching: Practice and Critique*, *10*(4), 116–126. Retrieved from http://education.waikato.ac.nz/research/files/etpc/files/2011v10n4art7.pdf

Yin, R. K. (1994). *Case Study Research. Designs and Methods*. Thousand Oaks - London - New Delhi: SAGE Publications.

Yore, L. D., & Treagust, D. F. (2006). Current realities and future possibilities: Language and science literacy-empowering research and informing instruction. *International Journal of Science Education*, *28*(2–3), 291–314. https://doi.org/10.1080/09500690500336973

Zohrabi, M. (2013). Mixed Method Research: Instruments, Validity, Reliability and Reporting Findings. *Theory and Practice in Language Studies*, *3*(2), 254–262. https://doi.org/10.4304/tpls.3.2.254-262

APPENDICES

A – Piece of *H(À) Educação* in *Diário de Aveiro* (December 12, 2019)

(H)À EDUCAÇÃO

Ana Raquel Simões e Valentina Piacentini *

Sabia que... Ciências e Inglês se podem aprender na mesma sala?

Várias têm sido as abordagens e metodologias que defendem um ensino integrado, plural, colaborativo, em que diferentes disciplinas se articulem para uma formação holística dos alunos. Ora, uma das formas de o fazer é combinando o ensino da língua estrangeira com o de uma outra disciplina dita "não linguística" (como Físico-Química, História, Geografia, Artes...). Como se chama esta abordagem? Trata-se de CLIL, termo que foi utilizado pela primeira vez em 1994 por Maljers e Marsh, e que, em Inglês, significa "Content and Language Integrated Learning", isto é, a língua aprende-se porque se utiliza para aprender. Em Espanha, país onde esta abordagem é amplamente estudada e aplicada, usa-se o termo AICLE ("Aprendizaje Integrado de Contenidos y Lenguas Estranjeras").

Enquanto que em 2002 se estimava que apenas 3% das escolas europeias utilizavam a abordagem CLIL, este número tem vindo a crescer de forma significativa por toda a Europa, utilizando, quer línguas estrangeiras, quer línguas minoritárias dos países em questão. Como língua estrangeira, o Inglês é a mais utilizada, sobretudo em disciplinas como a Ciência, Matemática, Geografia, História e Economia.

Em Portugal, a abordagem CLIL começou também a ser utilizada, nomeadamente num estudo piloto com início em 2011, o Programa Escolas Bilingues em Inglês, organizado pelo Ministério de Educação em colaboração com o British Council, que envolve, neste ano letivo, 26 agrupamentos. De uma forma algo diferente, por iniciativas dos professores e como oferta da escola, também se têm desenvolvido outros projetos com uma abordagem de tipo CLIL, como o projeto "English Plus", dinamizado no Agrupamento de Escolas Soares de Basto (Oliveira de Azeméis) de uma forma sistemática e com algumas iniciativas no Agrupamento de Escolas de Sever do Vouga.

Este projeto começou em 2010 com uma única turma do 7.º ano, envolvendo as professoras de História e Inglês e contando com o apoio e a avaliação de uma equipa do LALE (Laboratório Aberto para a Aprendizagem de Línguas Estrangeiras), estrutura do CIDTFF da Universidade de Aveiro. A partir de 2014, o projeto começou a articular as disciplinas de Ciências Naturais e de Inglês, envolvendo atualmente cerca de 5 turmas do 3.º Ciclo do Ensino Básico. Considerando o ano letivo de 2015-2016, Valentina Piacentini tem vindo a estudar o referido projeto no âmbito do seu doutoramento (orientado por Ana Raquel Simões e Rui Marques Vieira), focando-se nas possíveis vantagens da presença do Inglês para ajudar o desenvolvimento das línguagens (não apenas a verbal) usadas nas e para as Ciências.

Em termos práticos, como decorre esta abordagem nesta escola? Os alunos das turmas do projeto "English Plus" têm o seu horário organizado da seguinte forma: i. 45 minutos de Ciências Naturais com o Inglês, num regime de co-docência envolvendo a professora da disciplina e a de Inglês simultaneamente na sala de aula; ii. 45 minutos de Ciências Naturais somente em Português com a professora de Ciências; e iii. 45 minutos da "hora de projeto", em Inglês, onde são abordadas temáticas sócio-científicas e culturais.

Assim, os alunos não só aprendem a "matéria" de Ciências em Inglês e Português como desenvolvem a sua literacia científica, refletindo sobre o papel das línguas (e não só do Inglês) na Ciência, acabando por se envolver mais também pelo uso de recursos mais diversificados e interativos. Além disso, os alunos aumentam o número de horas de contacto com as línguas, ganham maior consciência do seu repertório linguístico-comunicativo e dos seus próprios processos de aprendizagem, bem como têm a possibilidade de participar em atividades fora de sala de aula, organizadas com e pelos alunos, em que se tem destacado o constante envolvimento das famílias e de outros parceiros do projeto.

* Centro de Investigação Didática e Tecnologia na Formação de Formadores (CIDTFF) da Universidade de Aveiro

anaraquel@ua.pt & valentina.piacentini@ua.pt

Artigo escrito ao abrigo do novo Acordo Ortográfico

Text previously available through the UA news webpage, https://www.ua.pt/pt/noticias/13/62079.

B – Teacher semi-structured Interview guides

n.	QUESTIONS FOR TEACHERS (EN, English; SCI, Science)	CLIL*
Objective: to characterise the interviewee's profile as a school teacher		
1	*Qual é o seu tempo de serviço como professora na escola?* EN - *Brevemente, qual é o seu percurso de formação para ser Professora de Inglês?* SCI - *Brevemente, qual é o seu percurso de formação para ser Professora de Ciências*? *Colaborou alguma vez com professores de outras áreas? Como correu?*	-------
Objective: to identify the interviewee's (learning) experience with the target subject (EN) / additional language(s) (SCI) integrating the "English Plus" school project		
2	EN - *Pode descrever a sua experiência de aprendizagem escolar em Ciências?* SCI - *Pode descrever a sua experiência de aprendizagem com as línguas estrangeiras?* EN - *Como pensa que utiliza estes conhecimentos no seu dia a dia?* SCI - *E na utilização (comunicação informal, estudos superiores, no trabalho, etc.)?*	Target language competences for teaching CLIL
Objective: To understand the teacher's perspective on the existence of languages and representations in the specific discipline of the programme		
3	*Pode explicar a sua posição/opinião em relação à afirmação "o professor de Ciências é um professor de língua(s)"?*	Implementation Interculturality
Objective: to delineate teaching methodology in terms of preparation and management of learning scaffolding, student participation and classroom practices		
4	*Pode falar sobre alguns exemplos na planificação e implementação das suas aulas que lhe permitem tornar conceitos e temas curriculares/científicos compreensíveis para os seus alunos?*	Course development Implementation Second language acquisition Learning environment management Learner focus in CLIL environment Learning skills focus in CLIL
5	*Em que medida considera importante a participação dos alunos em sala de aula?* *Como a promove no âmbito das suas aulas de Inglês/Ciências?*	
6	EN - *Qual é o papel que atribui à problematização, ao questionamento e à argumentação na aprendizagem do Inglês na escola?* SCI - *De que maneira descreveria o papel da manipulação e experimentação na aprendizagem das Ciências na escola?* EN - *E à manipulação?* SCI - *E do questionar? E do argumentar?* EN - *E à colaboração?* SCI - *E da colaboração?*	
Objective: to identify the teacher's perspective on the cultural potential of the linguistic subject (EN) / the nature of the non-linguistic subject (SCI)		
7	EN - *Acha que a aprendizagem da língua inglesa pode promover o plurilinguismo? Como?*	Integration Interculturality

	SCI - *Concorda com a ideia que o conhecimento científico se constrói? Como?*	
8	EN - *De que maneira pode ser trabalhada a dimensão cultural nas aulas de Línguas?* SCI - *Como pensa que nas aulas de Ciências se possa aprofundar uma(s) cultura(s)?*	
9	*Que ligações pode destacar entre a didática das Ciências e a prática do Inglês?*	
Objective: to characterise the knowledge/experience that teacher has about/with this approach (CLIL)		
10	*Pode partilhar o que sabe sobre o CLIL (*Content and Language Integrated Learning*), a abordagem do projeto* English Plus*?* *Acha que já tem implementado aulas ou parte delas através desta abordagem?*	Programme parameters
Objective: to describe conceptions that teacher has on the approach in terms of implementation, contributions, development, expectations		
11	*Quais são as responsabilidades (na planificação e implementação) que considera que um professor tem como professor CLIL?*	CLIL policy Lifelong learning
12	*Como imagina uma aula CLIL que integre os quatro Cês (Conhecimentos disciplinares; processos Cognitivos implicados; contextos Comunicativos; e aspetos Culturais) sugeridos em textos de referência?* *De que maneira pensa que o CLIL possa promover a aprendizagem das Línguas/Ciências?*	Programme parameters Course development Integration Implementation
13	*Como equaciona a avaliação de módulos realizados em ambiente CLIL?*	Learning assessment and evaluation in CLIL
14	*Quais são as necessidades (ao nível de organização e formação) que considera que um professor tem como professor CLIL?*	CLIL policy Lifelong learning
15	*Tem expetativas em relação a esta abordagem em termos de benefícios (profissionais e pessoais)? E de preocupações?*	Programme parameters
16	*Acredita que esta abordagem implique uma "sobrecarga"? Em que sentido?*	
17	*Para si, qual é a posição/distância do CLIL com respeito à disciplina linguística e à não linguística (no nosso caso, Ciências)?*	-------
Objective: to open the interview to further contributions		
18	*Quer enfatizar alguma ideia ou acrescentar um conceito ou colocar uma dúvida?*	-------

* possible areas of competences as presented in the CLIL Teacher's Competences grid (Bertaux, Coonan, Frigols-Martín, & Mehisto, 2010)

C – Former student semi-structured Interview guide

a) To know the former students' viewpoint about the EP project, co-teaching of History and English, and the foreign language used alongside:

1. *Gostaria que expressasses a tua opinião sobre o projeto "English Plus" de História… (organização, constrangimentos, desafios, vantagens)*

4. *Achas que havia diferença entre as aulas em que a professora de História e a professora de Inglês estavam juntas e as aulas em que havia só a de História (maneira da professora apresentar e tratar a disciplina de História)?*

5. *Lembras-te de alguma situação em que o facto de utilizar o Inglês facilitou a aprendizagem com respeito ao uso do Português?*

b) To identify learning processes, obstacles and benefits students experienced within the programme:

2. *Tiveste dificuldades durante o projeto? Se sim, quais? Como conseguiste superá-las?*

3. *Qual a disciplina que mais beneficiou (em termos de estruturação e compreensão, possibilidades de comunicação, integração com a realidade) com o projeto? Porquê? E agora que estás no secundário?*

REPEATED **5.** *Lembras-te de alguma situação em que o facto de utilizar o Inglês facilitou a aprendizagem com respeito ao uso do Português?*

8. *Consideras que o projeto trouxe algumas facilidades no estudo das disciplinas científicas? Se sim, como?*

9. *Quais as sugestões aos alunos do 3º ciclo que estão agora envolvidos no "English Plus" de Ciências Naturais?*

c) To characterise linguistic and intercultural features in EP learners, also in relation to having had a higher exposure to English:

6. *Gostavas de conhecer ou conheces outras línguas? Quais?*

7. *Achas que o Inglês (o facto de aprender/usar esta língua) despertou-te a vontade de estudar/aprender outras línguas e culturas? De que maneira?*

D – Current student semi-structured Questionnaire guide

Objectives	n. question	Typology
To characterise the student in terms of her/his school and language profile	**1***	Open-ended (short-text)
	2*	Closed-ended (multiple choice)
	3*	Closed-ended (multiple choice)
	4*	Closed-ended (dichotomous)
	5*	Closed-ended (multiple choice in a matrix)
	7*	Open-ended (short-text)
	8, all * except b), i) and j)	Closed-ended (multiple choice plus other) from a) to h); Open-ended (short-text) in i) and j)
To understand in which contexts students daily experience the combination of Science and English	**6***	Open-ended (long-text)
To know students' opinion and disposition on (the importance of) foreign languages	**9A or 9B ***	Open-ended (long-text)
	10*	Open-ended (long-text)
To know students' opinion and disposition on (the importance of) Sciences	**11***	Open-ended (long-text)
	12A or 12B *	Open-ended (long-text)
To identify the student difficulties related to Science learning and literacy	**13*, from a) to k)**	Closed-ended (matrix of Likert-type scale + N/A)
To know how students consider learning and teaching in Science and English at school	**14***	Open-ended (long-text)
	15*	Open-ended (long-text)
	16*	Closed-ended (five-point scale from school evaluation values)
	17*	Closed-ended (five-point scale from school evaluation values)
To understand how students relate with the CLIL approach and their suggestions	**18*** **18.1***	Closed-ended (N/A + Likert-type scale) Open-ended (long-text)
	19* **19.1***	Closed-ended (multiple choice) Closed-ended (multiple choice)
	20*	Open-ended (long text)
	21*	Open-ended (long text)
To extent knowledge on learners	**22**	Open-ended (free)

* answers compulsory in the Google Drive form available in http://goo.gl/forms/ls5tXdzQNc

E – Convention used in transcribing Interviews

Paralinguistic events (only elements that can be heard)	Symbols
Interrogation (rhetorical or not)	**?**
Exclamation (surprise, fear, request, obvious thing, etc.)	**!**
Not identified or unintelligible	**XXXX**
Emphasised word or expression	**CAPITAL**
Short pause (t ≤ 2')	**.**
Average pause (2' ≤ t ≤ 4')	**..**
Long pause (4' ≤ t ≤ 7')	**…**
Very long pause (t ≥ 7')	**…. (t=…)**
Avoiding ambiguous meanings (*não, quero dizer … ≠ não quero dizer …*)	**,**
Speaker suddenly understands	**Ah/ah**
Speaker fumbles or stammers	**Ahm/ahm**
Speaker shows to follow the interlocutor	**Uhm/uhm**
Speaker agrees with the interlocutor	**Hm/hm**
Speaker questions or doubts	**Hum/hum**
Not verbal actions (to smile, to laugh, to sigh, to draw, etc.)	**(verb)**
Quote of authors or documents	**{words}**
Interlocutor interrupts the speaker and speaks	**<<talk>>**
Facts occurring besides the interview	**((fact))**
Speaker does not finish the word	**fini-**
Words or expressions talked in a loud voice	**#expression#**
Words or expressions talked in a low voice	***expression***
Proper nouns (cities, countries, institutions, programmes, disciplines, festivities, concepts, etc.)	**Science**
Numbers (years, grades, length of time, etc.)	**2015**
Acronyms	**CLIL**

* after ., .. or … capital letters, also in parentheses and for Ahm, etc.

** sometimes long interruptions, other times is to show the flow

*** time corresponding to the audio is pointed out from time to time

F – Teacher verbatim transcribed Interviews

Entire transcriptions of teacher interviews (Eng-old, Eng-new, Sci-new, Sci-old) were made available to the juri, but they were removed from the final version of this dissertation.

AVAILABLE ON REQUEST (PP. 217-259)

G – Former student transcribed Interviews

The following is a preliminary content analysis in which long excerpts from each interviewee were grouped according to themes broadly determined by the questions asked; everything that was not an interest of analysis was deleted; colours might have helped categorization.

a. LEARNING OF ENGLISH AND DESIRE TO KNOW OTHER LANGUAGES AND CULTURES (6 AND 7)

STUD	QUOTATIONS
fsSci_1	Tive Francês […] mas já não me lembro muito bem agora. Há 2 línguas que eu gostava mesmo de saber. Que era o Alemão por motivos de trabalho e não só porque gosto da língua não sei #gosto do país# e Italiano (ri) <<hm>> curiosamente. Acho que é uma língua […] muito cantada gosto muito e eu adorava saber falar Italiano. […] estou a pensar em quando eu for para a universidade tirar um curso a parte de Alemão e se não fosse pelo Inglês se calhar nunca tiraria […] Porque […] o projeto de certa forma alertou-me para o facto de de ahm em termos de trabalho que é importante saber essas línguas e saber mais. Mesmo […] em termos de língua em termos de conhecimentos culturais […] normalmente temos as aulas mas […] o projeto despertou-nos <<uhm>> muito para a essa realidade […] o Alemão que eu gostava de aprender e o Francês e estas línguas […] acho que é que é importante não nos focarmos só no Inglês mas noutras línguas em geral […]
fsSci_2	[…] conheço por exemplo Espanhol que eu gosto imenso e já tentei de entrar em contato com a língua e até gostava inclusive de fazer agora um curso intensivo de Espanhol para dominar melhor a língua ao nível de escrever e gostava também muito de aprender Italiano <<obrigada>> (ri) gosto muito e como o meu pai sabe falar eu então já entrei em contato com a língua mas ainda é um bocadinho difícil para mim e também. Eu gostava de saber falar 7 línguas na verdade […] é (sorri) um bom número (ri) e porque normalmente as pessoas ahm por exemplo #dos negócios# […] não tanto agora mas mais antigamente falavam sempre 7 línguas agora é mais só o Inglês mas eu gostava de saber falar 7 […] Eu penso que quando nós estamos #a aprender uma língua# é é essa língua essa cultura que nós estamos a aprender o que pode despertar é a VONTADE de mas […] por exemplo. Eu tenho vontade de aprender a falar Espanhol porque por exemplo vou muitas vezes a Espanha gostava de comunicar melhor com Espanhóis […] no que toca o Inglês #já é diferente# […] porque por exemplo é muito mais útil para muitas mais coisas #não é só para falar# […] às vezes #para ver televisão# […] é importante perceber e acho que as culturas #são muito diferentes# acabando por não estar intimamente relacionadas. Mas contudo aprender uma língua e dominá-la também nos dá a ideia de que podemos aprender mais e que de facto […] somos capazes de ahm […] E dentro do próprio Inglês há as variâncias que estão #totalmente ligadas à cultura#. […] nós nas aulas abordávamos estas 3 <<ok>> estas 3 variantes [a Americana a Britânica e depois a Australiana]
fsSci_3	Tirando as aulas de Francês que tive na escola n- não aprendi mais nenhuma língua (ri) ahm mas sim […] por exemplo Espanhol. Era uma das opções que tínhamos no no 10º ano ahm. […] ao interagir com as pessoas e ter uma #melhor comunicação# [o Inglês com o projeto promoveu a vontade] de conhecer mais mais países ahm. Nós entretanto também fomos à Áustria […] faz com que nós queiramos sempre mais e conhecer mais e estejamos mais à vontade #com as outras culturas# […] nós tivemos algumas aulinhas de #Alemão# para tentarmos estar minimamente à vontade no no país ahm e #sempre# foi uma língua que nos foi incentivada também pela professora de Inglês que também dava aulas de Alemão e fomos aprendendo um bocadinho […] Sim ajudar qualquer pessoa na rua de de outro povo de outra cultura é sempre mais fácil comunicar em Inglês do que em Português porque muitas pessoas até nem sabem a língua portuguesa […] Mas eu acho que quanto mais soubermos #melhor# e mais estamos à vontade e. Pois que é enriquecedor
fsEcn_4	Bem. Coreano vou querer. O ano passado XXXX eu comecei a estudar #por mi mesma#. Comecei a ir a sites por exemplo existe uma rapariga brasileira que é professora de Coreano. Ela dá aulas por internet. E tenho Mandarim mesmo. Aqui na escola. […] foi para mim muito difícil estudar Inglês mas […] #o conhecer também aquela língua# eu comecei a despertar interesse #para outras línguas# <<uhm>> a partir do Inglês foi logo […] Deu-me coragem para aprender outras línguas porque ao final as dificuldades sempre trouxeram alguns proveitos [Naqueles sites onde estou a aprender Coreano] quando XXXX as vogais por exemplo em Coreano tem muitas <<uhm>> então estão escritas em Inglês […]
fsEcn_5	Nós tivemos no 7º 8º e 9º ano tivemos Francês mas do Francês não gostei muito […] também não gostei muito de aprender. Ahm mas gostava de aprender por exemplo Mandarim porque […] na área da Economia acho que o Mandarim vai ser #muito importante no futuro# […] Comecei […] ver falar com outras #pessoas de outras línguas# e #pensar noutras línguas# também dá para pensar algumas maneiras em Inglês como não dá para pensar em Português é diferente <<uhm>> e […] ahm conhecer outras culturas é interessante também […] Porque eu pensava que era que não dava para falar outra língua sem ser o Português que é a nossa ma- #a nossa língua# e a partir do Inglês eu comecei a ir a saber que é #é possível# e não é assim muito difícil #falar outra língua# […] Falar com outras pessoas em Português é mu- é menos provável do falar com outras pessoas em Inglês […] por exemplo os meus primos são de

	França <<ah!>> E eu falo com eles em Inglês que eles também sabem um bocado […] quando vêm para Portugal <<ok>>. Eles tentam falar em Francês mas eu também não sei muito Francês então falamos em Inglês […]
fsSci_6	Sim ahm eu também conheço Francês […] gostava também de aprender a falar se calhar Japonês […] gosto também da cultura deles [o Inglês com o projeto] foi interessante gostei do processo de aprendizagem e acho que deu-me acesso. A novas coisas facilitou-me por exemplo em #obter informações# e […] a professora falou-nos também acerca de algumas diferenças no vocabulário de ahm do Inglês australiano também e achei assim interessante <<pois>> a diversidade […] Acho que é uma ferramenta importante porque o Inglês é um- é a língua universal e permite-nos comunicar com outros povos que. Não falam a nossa língua ahm […] Por exemplo. Fomos à Áustria <<uhm>> […]. Não falávamos Alemão assim pronto XXXX falava Inglês […]
fsSci_7	Ahm já tive também aqui na escola ahm a aprendizagem da língua francesa ahm tenho algum interesse também em conhecer também outras línguas por exemplo a língua francesa gostei de aprender mas neste momento se calhar por não usar muitas vezes já está um pouco #enferrujada# <<hm>> não é? […] tivemos […] algumas aulitas de Alemão por uma visita de estudo que fizemos à Áustria e também gostei de aprender assim mas apenas aprendemos as palavras mais básicas ahm <<se começa por lá>> pois mas também nunca continuamos e portanto é assim gostar gostava de aprender outras línguas obviamente mas ahm se calhar requer muita prática <<uhm>> e não sei se conseguia aprender tão bem como sei o Inglês <<uhm>> [o Inglês com o projeto despertou a curiosidade para outras línguas e culturas] porque .. Percebemos logo que era totalmente diferente do Português não é? E desperta sempre aquela curiosidade de perceber se as outras línguas também têm tantas diferenças e existem coisas em comum entre as línguas entre as culturas e […] de aprender mais sobre #essas mesmas línguas# […]
FsEcn_8	[…] Gosto muito de línguas de aprender línguas e gostava de aprender mais ainda. Mas o Inglês é a minha preferida (sorri) [o Inglês com o projeto despertou a vontade para outras línguas e culturas] porque como nós contatamos com com a cultura inglesa e tiv- ao ter ahm facilidade em aprender a a língua inglesa se calhar despertou mu- o interesse em #aprender outras# e. Não ficar só por ali e por isso decidi como já tinha Francês na escola e até entrei […] acho que durante o projeto como ahm tive aquele XXXX todo ahm aprender a língua e e aprendi os métodos todos para aprender e <<hm>> desenvolvia essa #essa capacidade#. […] Contatamos com outras [culturas de língua inglesa]. Por exemplo a de #Estados Unidos# e ahm e agora não me lembro muito bem mas eu acho que nós também fomos contactando com com outros […] Claro que nós como estávamos a abordar o Inglês acho que. Fizemos o esforço por contactar com. O Inglês mas. […] Eu penso que não [contatamos com países que não são de língua inglesa]
fsEcn_9	Conheço Francês estive durante 3 anos mas não sei falar assim grande coisa mas gostava de aprender outras línguas principalmente o Espanhol […] nós estamos ficamos mais interessados #pela cultura inglesa# tanto que fomos a Londres e e com aprendendo outras línguas de certa maneira estamos a descobrir #a cultura de outros países#. Sim. Despertou-me neste sentido […] com o projeto não conhecemos mais outras culturas mas despertou o interesse em […] vir a aprender outras línguas porque é é sempre diferente da nossa <<uhm>>. *Conhecemos outras coisas que aqui* aqui não conhecemos e o projeto ajudou nisso porque nos permitiu #abrir os horizontes#
fsHum_10	Para além do Inglês só conheço o Espanhol e o Alemão mesmo pouquinho […] eu desde pequenina tive esse bichinho dentro de mim agora […] sinceramente o English Plus ajudou-nos bastante nisso #nesta área# […] Acho que sim [a língua inglesa despertou esta vontade de aprender de outras línguas e culturas] até porque a língua inglesa é utilizada em vários países […] por exemplo #a Índia# eu gostava de visitar a Índia mas se eu fosse para lá se eles falassem só #o Indiano# (sorri) não percebia nada. Agora como falam Inglês desperta mais aquela curiosidade de conhecer #o país# […] DESPERTA-ME curiosidade estas línguas assim étnicas por exemplo África tem bastantes e eu gostava de aprender nem que seja uma […] XXXX outras línguas ajuda bastante porque tem assim uma certa ligação […]
fsSci_11	XXXX sempre gostei de aprender um bocado de Italiano e Russo (ri) [com a que contatei através de] Filmes XXXX ahm às vezes na Internet. Mas de resto eu acho que a cultura e o povo também #são interessantes# […] Sim o Inglês despertou curiosidade no Inglês […] Clássico, Americano (ri) XXXX. Acho que era muito mais à base do Americano que eu aprendi mais <<uhm>> […] muito mais #presente# na nossa sociedade de agora […] Ligeiramente despertou-me a curiosidade pelas outras línguas e por outros países mas. […] por exemplo na praia ouvia Italiano e achava que era uma língua bonita e tinha também comprado um livro (sorri) que não tinha reparado que era Italiano (sorri) <<ah é?>> […]

b. OPINION ABOUT THE PRJ, DIFFIC. ENCOUNTERED AND SUGGEST. TO OVERCOME THEM (1, 2 AND 9)

STUD	QUOTATIONS
fsSci_1	[…] permite ter muitos mais conhecimentos de Inglês e melhorar as notas eu pessoalmente tinha melhores notas na parte de História […] em Inglês do que a parte […] em Português nós tínhamos os testes divididos. […] mas também ao nível social […] ainda hoje às vezes #falo mais Inglês com [amigos meus portugueses] que em Português# e […] mesmo na televisão […] já percebemos muito mais aquilo que eles dizem […] mas adquirimos um conhecimento enorme […] em diferentes áreas não é só em História ou não é só aquela metodologia de trabalho que temos de gramática [mas] noutras situações Eu pessoalmente não tive muitas dificuldades no início é um bocado difícil de habituar porque não estamos habituados

	ao Inglês técnico de História […] mas […] começa a ser automático e ahm a carga horária também não era muito complicada tínhamos só mais uma aulinha de 45 minutos mas como nós […] gostávamos daquilo […] pelo contrário o projeto até era a parte que me safava entre aspas […] eu nunca foi muito boa em História mas […] vou ter boa nota por causa da parte em Inglês porque eu sempre pessoalmente sempre me safei muito melhor em Inglês <<uhm>> […] Eu se calhar não daria sugestões específicas para estudar diria para aproveitarem […] é muitos conhecimentos que se ganham com aquilo que vão notar que vão precisar imenso porque eu eu notava as diferenças entre o meu conhecimento e os da minha turma e das outras das outras turmas que não tinham estado no projeto […]. Excelentes para o trabalho não só no secundário mas mais tarde. Inglês técnico Inglês específico para uma determinada área é muito importante e se eles estão em Ciências Naturais para quem quer seguir Ciências é excelente porque nós não temos alguns conhecimentos porque dávamos mais História mas […] eles vão ter muito mais facilidade mesmo para procurar coisas ou no futuro quem sabe se alguém quisesse sair do país é muito mais fácil para quem está já #habituado a esta terminologia em Inglês# <<uhm>> portanto sugiro para aproveitarem ao máximo […] eu tenho uma uma visão muito positiva deste projeto mas acredito que haja gente que a certa altura disse não eu não consigo fazer isto porque se calhar #não tinha as notas que queria# e pensava que era por causa do Inglês e se calhar até era […] No fundo eles têm que trabalhar. Para conseguirem perceber porque. […]
fsSci_2	[…] Eu penso que o projeto English Plus teve um peso muito importante na minha vida na escola […] porque o facto de nós termos a História em Inglês foi uma coisa muito diferente […] nesta escola […] pois nós fomos pioneiros e esto também nos deu uma responsabilidade. E foi muito bom porque nós aprendemos imenso. […] entrei mais em contato com a língua e depois […] mesmo fora do projeto havia essa [intensa] relação com os professores #que este projeto proporcionou# […] em todas as atividades […] MUITO diferentes muito diversas as peças de teatro […]. Durante aquela aula que nós tínhamos extra e #isso era muito bom# e […] a nossa turma estávamos todos a trabalhar pelo mesmo […] bastante unida […] […] principalmente a professora de Inglês preocupou-se bastante em que nós entendêssemos tudo que era dito. Porque se nós entendêssemos claro que tínhamos depois mais facilidade em dizer aquilo que tínhamos ouvido e expressar a nossa própria. Ideia e eu então no início eu principalmente a escrever #tinha muita dificuldade# mas o que é certo é que no final do 9º ano já conseguia fazer uma composição ahm que no meu ponto de vista #era bastante boa# principalmente nos testes de História […] em Inglês e então eu depois já conseguia fazer isto mas no início claro que foi difícil porque claro que não vinha assim com muita preparação. […] eu queria dizer alguma coisa e não sabia como (suspira) porque. Também eu naquela altura era muito ahm era uma aluna muito tímida <<uhm>> pouco participativa <<hum>>. Nas aulas e depois então o facto da professora também per- ter a preocupação de perguntar a TODOS os alunos da turma não era só a um ou a dois era a todos e eu então comecei a XXXX a vontade de expressar e depois ahm comecei a XXXX por prestar mais atenção mesmo quando eu ouvia o Inglês na televisão o Inglês nas músicas eu começava entre aspas a #abrir mais o ouvido# e então depois conseguia ahm tudo junto consegui evoluir e ahm penso que o resultado foi bom porque hoje. Talvez graças ao projeto ahm eu continuei a estudar Inglês mesmo fora da escola e e agora já estou num nível muito elevado […] Acho que primeiro de tudo devem aproveitar ao máximo este projeto porque é de todo muito vantajoso […] às vezes as pessoas mais novas não têm noção de qual importante é ter estas atividades porque nós dedicávamos muito do nosso tempo mesmo tempo livre para atividades de projeto e nós estávamos FOCADOS no que estávamos a fazer e é muito importante que os alunos de agora ahm percebam que […] #que se dediquem a essas atividades# porque até podem parecer brincadeiras mas #não são# são muito importantes […] o que está por detrás é é muito val- é muito trabalho e #também no fim é vantajoso# porque nós é que tiramos o proveito de tudo. […] que assumam a responsabilidade que este projeto exige […] que também procurem fazer um trabalho em casa <<hm>> e não é um trabalho intensivo […] de agarrar nos livros e estudar se bem que eu […] em casa ia ler os textos à frente e a pensar nos textos <<uhm>> para depois chegar as aulas <<hm>> e já ter uma uma determinada reflexão feita para depois estar mais como tinha um bocadinho mais de dificuldade que os outros no início […] também para estarem mais atentos a aquilo que é dito [nas notícias em Inglês] e fixar determinadas palavras que são muito importantes […] agora que eu vou entrar na faculdade se não tivesse criado este gosto pelo Inglês se calhar iria a ter muita dificuldade porque há muita coisa na faculdade [de Medicina] que é em Inglês […]
fsSci_3	Achei um projeto ahm muito dinâmico muito ahm educativo que nos possibilitou muitas […] aprendizagens ahm. Facilitou-nos a- alguns contatos conseguimos ir a várias visitas de estudo a apresentar o no- o nosso projeto a várias universidades […] no 7º e no 8º ahm a professora [de História] que também iniciou connosco e depois no no 9º teve de mudar […] No 9º começamos também a ter Ciências em Inglês […] algumas informações eram em Inglês Ahm eu tinha bastantes dificuldades em Inglês. Na disciplina mesmo em si. E o projeto ajudava-me a ganhar vocabulário e pux- puxava por mim no sentido de desenvolver o meu vocabulário e a minha oralidade […]. O projeto ajudou-me nisso ahm a comunicar com os outros também porque ahm eu era assim um bocadinho (sorri) envergonhada […] Principalmente no Inglês e o projeto ajuda ahm uma pessoa a estar mais desinibida e #mais à vontade#. Com a língua e com os outros […] Ahm sim a professora dava-nos algumas dicas tínhamos apoio com a professora […] Penso que eles se devem esforçar porque é um projeto muito muito enriquecedor e na vida deles no seu futuro ahm vai-lhes trazer algumas vantagens e para se aplicarem porque não é um projeto assim ahm de um dia para a noite

	<<hm>> é há há mesmo que que ser aplicado para se esforçarem #para terem a recompensa# por exemplo nós fomos a Londres […] fizemos tanta tantos teatros em Inglês tan- fomos a tantas universidades ahm a tantos lugares a apresentar para tentar ahm tirar um bocadinho de proveito do do nosso esforço e espero que eles também consigam seguir #com o projeto como nós começamos# […] Para fazerem de tudo para conseguirem nem que seja ahm um um valor na na nota mas é sempre recompensador ahm e até para os professores é bom verem a evolução de dos seus alunos portanto acho que (sorri) não devem desistir
fsEcn_4	[…] sim bem a minha opinião antes e agora […] eu cheguei no 7º ano ahm naquele projeto e #muito indignada daquilo#. O meu Inglês de 5º e 6º ano era completamente o oposto do que eu tive no 7º e em diante. Ahm mas desde o 7º até ao 9º ano […] aquele trabalho que eu fiz ao longo daqueles anos vem […] #muito melhor# ahm nessa língua. Ahm falo com muita mais fluência ahm […] um professor de História naquela altura […] disse que eu tinha que passar a espreitar naquele projeto e ia ser complicado no início mas que eu ia ahm conseguir no futuro [no início] eu odiava ahm mas tornou-se muito interessante adorava as aulas de História em Inglês Ahm. Digamos que quando entrei no projeto ahm nas XXXX de Inglês eu gostava muito de ir ao Google Tradutor […] Terrível a professora apanhava-me sempre (sorri) que eu ia traduzir as coisas <<porque será?>> Não sei (ri com prazer). Ahm uma vez que a professora me tinha dado um foi um satisfaz muito baixo e foi aquilo mudei! Comecei a ver programas de televisão ler livros em Inglês. Pequeninos porque não conseguíamos <<mas se começa por lá>> pronto. E a partir de ali o Inglês tornou-se. Cada vez melhor. Sem XXXX da professora nós não conseguíamos […] […] eu diria mesmo para eles ahm lerem aqueles livrinhos pequeninos porque nós uma vez fom- ahm recebemos um grupo um conjunto de livros ahm de uma da embaixada quando participamos <<uhm>> numa viagem em XXXX. E isso foi algo que nos trouxe grandes benefícios […] não é necessário serem grandes livros muito grossos [ou serem as professoras a mandar ler] É que aqueles livros #se leem muito facilmente# <<hum>> e se eles lerem em voz alta praticam muito o seu o Inglês a pronúncia […]
fsEcn_5	Acho que foi um projeto muito interessante e que me ajudou muito a evoluir as minhas capacidades ao nível do Inglês […] ter História em Inglês foi uma uma boa experiência porque aprendemos palavras que em Português não existiam e vice-versa. […] nos testes [de História] a parte de Inglês era mais fácil admito […] ajudou muito nas notas […] só por exemplo os exercícios de Inglês […] a stora escolhia aquelas partes mais fáceis do da matéria [e] fazia ahm ligar que era era engraçado e era mais fácil […] no início depois lá no fim já fazíamos composições […] Acho que […] nunca foi assim muito mau em Inglês. Nunca tive assim muitas dificuldades […] Ah foi aquele impacto de ter História pela primeira vez em Inglês foi assim um bocado difícil mesmo porqu- falar #interagir com a professora em Inglês# era um bocado mais difícil que em Português mas nunca foi assim uma dificuldade muito grande […] […] por exemplo estão sozinhos e já pensar no quarto em vez de pensar em Português tentar pensar em Inglês que é é um exercício que a nossa professora nos aconselhou e ajuda muito realmente. E ver séries sem legendas e filmes sem legendas e tentar de fazer composições […] por exemplo do nosso dia a […] em Inglês <<sem que seja a professora a pedir>> sim é um processo […] para nos ajudar assim a ter melhor- #a ter um melhor conhecimento da língua# porque depois eles agora têm Ciências em Inglês não é? Em vez de História e […] Ciências têm ahm a parte da Biologia e ahm Ciências de- deste tipo tem deve ter #mais termos técnicos do que nós tínhamos em História# deve ser mais difícil para eles ahm mas acho que devem seguir estes conselhos de escrever em Inglês [o meu irmão que está agora no EP] no outro dia estava a fazer um trabalho sobre pinguins que era pa- trabalho de casa e foi lá a ajudá-lo que tinha assim umas perguntas e depois tinha que responder e ele esteve a ver um documentário em Inglês lá em casa e eu estive a ver com ele ahm e depois teve nas aulas a fazer o trabalho de casa que eram 20 perguntas e ele esteve a responder e eu corregi no fim […]
fsSci_6	Ahm acho que é um projeto interessante permite-nos desenvolver as nossas capacidades de […] de falar Inglês. Ajuda-nos também a aprender novo vocabulário e acho que foi uma experiência interessante […] aulas de História em Inglês e foi divertido aprender (sorri) foi diferente […] no primeiro ano que do projeto tive assim um bocado de dificuldade não estava assim muito habituado mas depois comecei pronto comecei a entrar dentro do daquilo que era feito […] Fomos aprendendo ahm vocabulário novo e depois pronto era era sempre pronto parecia que estávamos dentro daquilo que que era suposto fazer e já era mais fácil a professora também ajudava-nos em com qualquer dúvida qualquer dúvida que tivéssemos e *foi assim* Que eles se apliquem que aproveitem bem o projeto porque ahm é uma ferramenta que lhes vai permitir. Ganhar vai lhes permitir alargar os horizontes e também pronto vai os ajudar vai ajudá-los no futuro *e acho que é isso* […] Sim porque é diferente são coisas novas #não estávamos habituados a ter aquela disciplina noutra língua# […]
fsSci_7	[…] para mim ahm este projeto foi essencial especialmente porque eu ainda não tinha muito bem certeza […] do que é que eu queria ser não é? E não tinha muita confiança também a falar Inglês nunca tinha andado #em nenhuma escola de línguas#. […] percebia só umas coisas e ahm foi um desafio […] proposto pela professora mas eu ahm inicialmente foi obviamente um bocado difícil. […] penso que o projeto é é essencial para os alunos porque permite que eles. Se foquem não só em Inglês #mas também em História# e ao ao usar a língua assim dessa forma é muito mais fácil depois para aprender a língua ahm que por si só […] porque ao ao deixar de ser só sobre aprender o vocabul- os vocábulos e a língua ahm começamos a ficar mais #interiorizados com a língua em si# e começamos a usá-la mais facilmente […] e torna torna a matéria que estamos a dar muito mais interessante porque é uma forma mais original […]

	Pois no início obviamente um bocado difícil porque as professoras também ahm obviamente para nós interiorizarmos o Inglês elas tinham que falar Inglês ahm elas ajudavam-nos obviamente mas elas não ahm passavam para Inglês a Português a aula era dada em Inglês puramente. E inicialmente era um pouco difícil e colocar questões também era um pouco ahm difícil mas elas obviamente tínhamos sempre o apoio delas e ahm pedíamos sempre a ahm a opinião delas e fazíamos questões mesmo mesmo não sabendo muito Inglês #tentávamos de questionar em Inglês# e foi essa esse facto de estar continuamente a tentar tentar tentar que nos levou depois no final e #tornamo-nos todos ahm excelentes alunos p- em Inglês# principalmente […] Ahm. Continuar a nunca desistir! Nunca ter medo de falar nem nem fazer perguntas questionar sempre a professora porque elas vão sempre ajudá-los ahm a melhorar o seu Inglês especialmente e conheci muitos alunos que tinham MUITAS dificuldades em Inglês e nunca deixaram de fazer perguntas e hoje falam <<hum>> muitíssimo bem Inglês e ahm manter sempre o nível alto esperar sempre ahm melhorar as suas capacidades e vão conseguir de certeza […]
fsEcn_8	[…] eu acho que foi um projeto muito bom [ao nível] profissional e pessoal acho que me ajudou muito tanto no Inglês como ahm se se se calhar em atividades que agora eu desenvolvo no no secundário ahm ajudou-me muito a #realizar debates# aprender a fazer debates a a #pesquisar# ahm e princip- claro no no Inglês foi uma grande mais valia tanto que agora eu acho que domino bastante bem o Inglês e isso vai ser muito importante para mim #para a minha vida# […] eu sempre gostei muito do Inglês então nunca foi ahm nunca tive grandes problemas com ter que aprender mais a língua e também gosto muito de História portanto XXXX muito agradável […] Claro que […] quando nós gostamos e sentimos dificuldades trabalhamos sempre para <<hm>> e se nós não gostarmos se calhar ficamos com as nossas dificuldades e não tentamos superá-las […] Ahm. Quando encontrava por exemplo palavras mais difíceis tentava pesquisar saber que elas significam ahm. Não tanto na discipli- não tanto no Inglês mas quando tinha ahm dificuldades em História ahm ou e não percebia alguma parte de da matéria que estava em Inglês #ia perguntar às professoras# pedia para que me explicassem e ahm tentavam explicar em Inglês e depois se eu realmente não percebesse explicavam-me em Português […] no geral acho que nunca tive assim muitas dificuldades […] […] acho que têm que ser alunos empenhados primeiro não podem pensar que ahm vão para lá e que andam na balda não pode ser têm #têm que estudar sempre# para ter sucesso e acho que o Inglês já é uma língua. Fácil. Eu pelo menos acho que sim mas tem que haver sempre esforço dos alunos têm que ahm ver séries em Inglês sem legendas foi assim que eu aprendi muito Inglês ouvir música tentar perceber o que é que quer dizer #adquirir muitas expressões# porque acho que é isso que nos ajuda muito no Inglês e e têm que ter sempre muita vontade de trabalhar porque se não aquilo que que nós conseguimos […] e onde nós fomos e e tudo aquilo que já vimos e experienciamos acho que eles só vão conseguir isso #a trabalhar#
fsEcn_9	Eu acho que o projeto ajudou muito […] quando eu entrei no projeto [porque o meu pai queria] eu tinha algumas dificuldades em Inglês e deparei-me […] mesmo de cabeça e tive que. Conseguir ultrapassar essas dificuldades mas ajudou mesmo muito porque naquela altura foi mais difícil mas agora no futuro #vi uns resultados# e já tenho mais facilidade com a língua inglesa Foi muito com a ajuda da professora Eng-old ajudou-nos muito com a ajuda daquela rapariga que entrevistou agora […] era muito boa e ela ajudava-me a traduzir algumas coisas de História porque #são conceitos muito específicos# e é preciso perceber bem e ela ajudava-me também a estudar e tive que trabalhar […] A trabalharem muito para aproveitar muito esta experiência porque va- é um experiência única e nos marca mesmo para a vida principalmente para aproveitarem a viagem que vão ter a Nova Yorque <<(ri)>> nem toda a gente têm […] e têm que aproveitar muito esta experiência porque nós não conseguimos nós só fomos a Londres [quanto aos que fizeram o 7º ano] devem entrar porque vai ajudá-los muito no Inglês mas que quem tem alguma dificuldade #vai ter muito trabalho# mas vai compensar
fsHum_10	Ante de mais ajudou-nos bastante com a língua ahm não aprendemos só o Inglês na disciplina de Inglês que é basicamente números os verbos e assim aprendemos algo que é diferente sobre uma História diferente ahm sobre a América a Grã Bretanha que nós não temos tanto este leque na na disciplina de História tanto seja no no no 3.º Ciclo e no secundário […] Foi uma experiência muito boa. Aprendemos bastante e .. a expressar melhor em Inglês também ... Eu acho que é esta a minha opinião […] foi benéfico Não, não tive nenhuma dificuldade <<nenhuma dificuldade?>> Porque eu gosto bastante do Inglês e também gosto bastante de História era uma coisa que me empenhava bastante […] se fosse Matemática e tal eu XXXX ajuda (ri) mas. Em História. Com Inglês perfeito [talvez não te estejas a lembrar] Não, não tive assim grandes problemas as professoras também ajudavam bastante Ahm. Que aproveitem bastante que é. Um projeto inigualável ahm é especial mesmo ahm não ver ter qualquer oportunidade depois do 3.º Ciclo. Tudo novo […] É assim todas as dificuldades para mim são superáveis e. Dizia para eles estudarem bastante porque nã- não se pode desistir à primeira não é?
fsSci_11	Eu gostei. Houve deu-nos a hipótese de aprender mais matéria [de História] e quer em Inglês pronto temos o Inglês que era na História e fizemos #muitas mais atividades que provavelmente não faríamos sem ser no projeto# […] Era muito também a parte das professoras também. Graças às professoras nos primeiros dias quando ahm começamos aquilo era ainda muito uma adaptação mas depois foi. Bom as professoras

	também estavam a adaptar-se a falar assim daquela maneira em Inglês. Principalmente a professora de História #mas depois começamos a entrar mais fluidamente na matéria# [as dificuldades foram] maioritariamente de comunicação foi era mais complicado nós falarmos. Durante 90 minutos de História em Inglês que era em Português ou até era. Em Inglês normalmente esses 90 minutos nós não falávamos sempre em Inglês [de situações em que tentei superá-las] não me lembro sei que a maioria das vezes era palavras técnicas em História que eram mais complicadas. […] Para abordarem o máximo que pudessem as em casa não só deixar a matéria em na escola <<hm>> tentar ver filmes em Inglês sem legendas. Ou legendas em Inglês de preferência que é para associar as palavras aos. Aos sons e isto tudo. Se bem que até as legendas de vez em quando dá jeito (sorri) para descobrir o significado de certas palavras […]

c. CHANGES IN TEACHING AND LEARNING PROCESSES (4 AND 5)

STUD	QUOTATIONS
fsSci_1	[…] eu lembro dessas aulas perfeitamente tínhamos os primeiros 45 as duas professoras e os segundos 45 só com a professora de História. […] em Português […] mas outras vezes continuava em Inglês mas eu não notava diferença porque a professora de História que nós tínhamos […] falava excelentemente Inglês as duas professoras trabalhavam MUITO bem em conjunto mesmo que a professora de Inglês tinha mais a preocupação de nos dizer o que significavam as palavras a professora de História não já avançava mais não é? Porque está mais habituada a aquele assunto a professora de Inglês se calhar tinha mais cuidado em dizer o que é que significa esta palavra no contexto em que está mas não se nota diferença ao nível de aprendizagem consegue-se perceber muito bem independentemente de estarem as duas juntas ou de estar só a professora de História […] […] eu NÃO sei porque é que tinha melhores notas na parte de Inglês mas. Por exemplo […] Eu SEMPRE tive melhores notas a escrever textos em Inglês que a escrever textos em Português. Eu de certa forma sinto-me mais confortável em Inglês do que em Português porque nós também tínhamos mais horas a falar Inglês nós trabalhávamos o Inglês #como se fosse a nossa língua materna# quase mas. EU desde pequenina é que falo Inglês e basicamente aprende- aprendi Inglês a ver filmes e essas e esse género de coisas […] pois ahm mas então. Comecei a me habituar mais ao Inglês e eu sempre tive #muita facilidade em Inglês# e acho que isto me ajudou em termos de História não percebo porque, porque supostamente os conteúdos são #são os mesmos# mas não sei se foi em formar as frases em formar as palavras <<uhm>> ou se foi por eu captar mais por ser Inglês porque quando é a língua materna normalmente nós temos ah! Eu sei. […] Quando é em língua inglesa <<XXXX>> ou outra língua exato se calhar temos mais atenção ao que as pessoas dizem #se calhar captamos mais# <<hm>> […] e isso ajudava-me muito porque era a parte do texto que me corria melhor que era a parte que eu tinha mais conhecimento que eu me lembrava <<uhm>> mais […] Eu já tinha pensado neste assunto […] a receber os textos e entregar aos meus pais ou à minha mãe eu mostrava e ela dizia então mas tiveste melhor em Inglês do que tiveste em Português? Porque não é normal supostamente o Português é a língua #materna# é a que devia ter melhor […] quando é em Português […] se calhar #não prestamos tanta atenção# […] A construção <<XXXX>> de frases […] Acho que não é isto […] nós quando escrevemos as frases temos tendência a contrariar-nos XXXX #escrevemos muito#. Dizemos uma coisa aqui contrariamos a seguir e […] eu tenho muito mais ahm hábito de fazer isso em Português #do que propriamente em Inglês# porque em Inglês eu tenho o cuidadinho TODO de fazer o que está aqui. De fazer tudo direitinho. E se calhar em Português como estou a escrever na minha língua materna às vezes nem me apercebo nem releio nem […]
fsSci_2	Sim eram mais interativas mas também porque nós tínhamos DUAS professoras […] a professora de História acabava por falar mais ou explicar mais mas depois a professora de Inglês ao mesmo tempo estava a apontar coisas no quadro que nós podíamos apontar no caderno […] havia conceitos que #nós não sabíamos# […] quando estávamos a dar História em Inglês […] há certos conceitos de História […] e que nós em Inglês podíamos não [conhecer] para nós apontarmos no caderno para depois quando tivermos no teste a fazer alguns exercícios em Inglês sabermos […] o que é que dizíamos e o que é que escrevíamos […] claro que é diferente ter duas professoras a dar uma disciplina #do que ter uma só# porque nós também não éramos uma turma pequena e de uma certa forma parece que havia MAIS atenção para nós […] quando estou numa aula que só tenho uma professora às vezes ahm a professora #não consegue chegar a todos# […] e. Depois […] nós sentíamos que estávamos todos a ir na mesma direção […] […] No início não achava mas depois. Como o Inglês eu penso que acho que toda a gente concorda que o Inglês é mais fácil do que o Português. Porque parece que o Inglês mesmo a estrutura frásica #é muito mais fácil# […] apesar de da minha língua materna ser o Português eu considero o Português uma língua muito difícil. E então às vezes o Inglês #parece que facilitava#. Mas no início não. […] não facilitou mas depois e #em determinadas ocasiões sim# […] no Português às vezes temos a necessidade de recorrer aos complementos eu lembro-me de um de uma situação de uma composição que eu fiz e que a professora Eng-old a professora de Inglês dizia muitas vezes que eu ahm colocava muita coisa que parecia Português porque eu tinha a tendência de pôr ahm nas frases em Inglês uns ditos complementos que colocava em Português porque nós em Português fazemos #frases muito grandes# #no Inglês não#. Se nós dizermos uma frase que é assim em Português em Inglês basta dizer só este bocadinho que #já está lá a ideia# <<uhm>> porque ahm em determinadas ocasiões o o o Inglês tem uma palavra que quer dizer mu- que tem lá tudo que muitas palavras

	em Português dizem contudo há palavras em Português que em Inglês não há <<hum>> […] por exemplo saudades <<hm>> […] mas claro que às vezes era mais fácil uma língua outras vezes mais fácil a outra mas no início sem dúvida que o Português era mais fácil (ri)
fsSci_3	[…] nas aulas de Inglês era só a professora de Inglês nas aulas de História ahm estava a professora de História e a professora de Inglês depois entrava ou saia […] por exemplo […] 90 minutos 45 eram em Português 45 eram era Inglês […] nós acabamos por habituar de tal forma que estarmos a ter aulas de História em Inglês ou em Português acabava por ser quase a mesma coisa para mim não porque tenho mais dificuldade em Inglês ahm mas a forma como é dada a forma como era exprimida acho que era igual […] A professora de Inglês dava mais auxílio […] na forma como nós falávamos em Inglês por exemplo a professora de História estava mais preocupada com o conteúdo da matéria a professora de Inglês era mais com o nosso falar com o nosso escrever da História em Inglês com #a nossa ortografia# digamos assim […] quando algum conceito [ao continuarmos em Inglês] era mais específico ou era mais difícil [a professora de História quando estava sozinha] traduzia para o Português […] […] estava-me a perguntar quando o Inglês é mais vantajoso do que o Português? […] Sim a língua inglesa DIZEM que é mais fácil […] na minha experiência ahm é era normal que o Inglês ahm fosse para mim ahm mais difícil de aprender. No entanto ahm sei que teve XXXX muito mais em Inglês do que em em Português. Ahm não sei se *me estou a explicar* (sorri) […] Sei que futuramente era mais vantajoso termos as aulas em Inglês #do que as aulas em Português# porque em Português qualquer turma está XXXX #em Inglês era uma coisa diferente# […] Eu acho que ganhamos vantagem ne- neste ponto
fsEcn_4	[…] foi só no início depois […] já íamos ter tudo […] em Inglês […] para o final do do 9º ano já era dado pelas duas porque #nós entendíamos aquilo tudo# já nós adaptávamos bem […] não era sempre as duas por exemplo uma tinha que sair e ficava a professora de História a dar ahm em Inglês não havia problema […] No começo porque como nós ainda não entendíamos bem ahm aquelas mudanças a a diferença na língua nós estávamos muito mais curiosos a estudar em Inglês do que em Português […] Ahm a professora de Inglês começava logo a aula #vocês a partir de agora não podem falar Português# têm que falar Inglês quem quer tirar dúvidas pergunta em Inglês […] [Sim] Por exemplo palavras ahm que em Português foram adaptadas de línguas estrangeiras e que nós nunca temos a certeza como é que se diz <<uhm>> corretamente […] Shopping! […] normalmente por exemplo vamos XXXX que é um shopping <<uhm>>. Nós não dizemos #que é um centro comercial# […] Está bem utilizada só que naquela altura não sabíamos dizer <<uhm>> corretamente <<uhm>>. O Inglês veio-nos dar. XXXX esta facilidade [para além de algumas palavras] Os verbos! Os verbos. São muito mais fáceis em Inglês do que em Português (ri) […] Ahm. Nós mesmo XXXX muitas conj- #conjugações# <<hm>>. Em Inglês aquilo baseia-se tudo no mesmo <<hm>>. Nós conhecemos aquela (sorri) digamos lengalenga <<hm>>. Então XXXX e já sabemos os verbos todos <<hm>>. Em em Português não é assim. A nossa gramática é muito complicada […]
fsEcn_5	Ah em Inglês era mais divertido porque nós aprendemos a stora também aprendia ao mesmo tempo que nós algumas coisas de Inglês na História […] e a stora de Inglês quando ela estava lá. Era muito mais fácil ter as aulas porque a professora de Inglês ajudava muito […] a professora de História também […] porque […] #era uma experiência nova para ela também# […] a professora tinha que fazer pesquisa para dar-nos as aulas e ela contava-nos histórias estavam na Internet fichas para nos dar e assim e aprender […] palavras que ela não conhecia e fichas novas que ela nunca tinha visto e coisas assim e era muito interessante e ahm as aulas em Inglês eram muito mais divertidas porque era a maior parte era. Na Internet e no quadro interativo e em Português era no livro e fichas de escrever a mão e assim porque são aulas convencionais [por parte da professora] é muito mais fácil dar com livro temos o livro em Português estamos a dar a matéria e a stora dá-nos a matéria em Inglês é que não dava porque não tínhamos suporte em Inglês no livro […] XXXX se estou a fazer composições por exemplo de um texto de Inglês e um texto de Português eu prefiro fazer composições em Inglês acho muito mais fácil [talvez os exercícios em Inglês do 7º ano fossem mais fáceis tipo de resposta fechada] sim a partir do 9º ano a stora por exemplo dava-nos três tópicos possíveis ou assim e composições que iam a ser em Inglês no teste de História e #nós tínhamos que estudar aquela parte em Inglês# […] Não sei eu também não foi grande aluno em Português e mesm- #todos os conectores# e assim e o Inglês é muito mai- porque eu por exemplo. Estou em casa e tou a ver filmes e séries em Inglês e tudo que estou a ver na televisão também é em Inglês já quase nem vejo nada em Português […] falar [em Português] é fácil mas #escrever é muito diferente# porque não podemos não podemos escrever da mesma maneira que falamos [tu eras desses alunos que pedia à professora para poder escrever em Inglês?] Há um curso de Economia em Inglês ali no Porto e eu até estive a pensar de me inscrever mas depois também. Porque como eu tenho média pa- para melhores universidades supostamente em Portugal <<uhm>> eu vou tentar essa mas aquela universidade que davam cursos em Inglês eu também estive a pensar em ir para lá […]
fsSci_6	[…] Na parte de Inglês acho que era uma parte mais lúdica mais interativa porque víamos vídeos às vezes fazíamos fichas […] acho que agora funciona de uma maneira diferente. O projeto. Nós […] não tínhamos hora de projeto era só […] a hora de História 45 minutos eram em Inglês e outros 45 [em Português] Em Inglês […] chegamos também a fazer algum teatro isto foi interessante ahm em relação ao Português […] começamos a habituar-nos a um certo ritmo de trabalho [em Inglês] e em Português acho que deixava de ser tão interessante […]

	Sim […] Porque acho que conseguimos ser mais diretos a falar Inglês. Acho que em Português temos várias palavras. Para dizer a mesma coisa acho que em em Inglês conseguimos ser mais diretos nas ideias [não dependerá do facto de não sermos nativos?] Sim podemos andar muito (sorri) #à volta das coisas# e acho que o Inglês também porque pronto depois ahm se não soubermos dizer uma coisa podemos sempre arranjar outras maneiras de dizer a mesma coisa [é o facto de ter de liderar com uma língua estrangeira!] no Inglês acho que este fator ajuda-nos mais a. Encurtarmos <<uhm>> a quantidade de palavras para pronto de expressarmos as ideias […]
fsSci_7	[…] É assim a nossa professora de História conseguia muito bem articular o Inglês porque ela também falava Inglês como primeira língua […] era de África de Sul […] havia sempre assim uma misturezita e nós […] havia matérias que falávamos só em Português […] alguns vocábulos um pouco mais difíceis […] mas obviamente […] é assim a disciplina […] que nós falávamos só em Inglês ahm tínhamos mais auxílios tínhamos mais algumas fichas mesmo para compreendermos melhor e para levar para casa e ver também do que em Português porque nós assimilávamos normalmente e naturalmente. […] porque nós precisávamos sempre mais um pouco de ajuda na matéria que dávamos em Inglês porque ainda […] não estávamos muito bem ahm habituados e […] a stora auxiliava sempre […] #para nós conseguirmos perceber# […] a matéria que nós dávamos em Português era sempre um pouco mais ahm fácil de integrar na nossa cabeça nós conseguíamos facilmente perceber e não precisávamos tanto de fichas de exercícios […] Nós [os alunos do projeto] muitas vezes afirmávamos que as composições que nós fazíamos em Inglês eram sempre mais fáceis para nos de realizar #do que as em Português# […] Porque nos sentíamos mais à vontade já em falar das matérias que dávamos em Inglês […] sentíamos que que s- em conjunto tínhamos que compreender todos bem a matéria e que conseguíamos passar bem pa- para palavras #aquilo que tínhamos percebido#. Em quanto que em Português costuma ser um pouco mais mais confuso porque há sempre INÚMERAS formas de dizer e .. [pode ser porque conheces melhor a tua língua materna] e estamos todos um pouco mais diferenciados do que em Inglês que aprendemos #todos basicamente juntos#. Os mesmos vocábulos e as mesmas coisas que depois conseguíamos passar muito para papel e conseguíamos muito bem perceber aquilo e portanto penso que e- por exemplo principalmente em História facilitou muito mais a aprendizagem [mas porque?] Talvez seja […] uma língua mais mais fácil de interiorizar não sei <<uhm>>. Nós realmente as matérias que damos em Inglês ahm se calhar lembramos todos ainda hoje <<uhm>> […] enquanto que em Português se calhar não não nos ficou #tão na memória# [mas porque?] Nós dar a matéria em Português damos em todas as aulas <<uhm>> […] foram dois anos especiais em que demos realmente ahm aquela matéria #específica em Inglês# <<uhm>>. Portanto todos nós nos armamos daquilo que #falamos no início# o que é que f- vamos #falar a seguir# ahm lembramos todos [é como se fixou a atenção das pessoas]
fsEcn_8	[…] nas aulas com a professora Eng-old ahm como dávamos em Inglês elas tentavam fazer ahm dar a matéria de uma forma mais interativa e através de atividades peças de teatro textos para nós analisarmos em grupo e eu gostava muito dessas aulas porque achava que eram mui- eram divertidas e ajudavam-me a aprender tanto que eu até gostava mais às vezes de estudar a matéria de História em Inglês do que estudá-la em Português porque achava que encaixava melhor e conseguia decorar melhor e conseguia aprender aquilo […] E mas também […] no 7º e no 8º era a professora Á. eu gostava muito da professora gostava muito dela só que entretanto ela teve de se ir embora depois tivemos o professor XXXX também dava muito bem a matéria […] como eu gosto da matéria de História [mas as aulas] eram diferentes gostava mais das de Inglês porque pronto era outra forma de aprender e acho que resultava muito bem […] [Sim] Ahm porque há matérias que tinham se calhar palavras MUITO específicas em Português e nós (sorri) os Portugueses complicam- acho que complicamos às vezes muito com a nossa língua e é uma língua que pronto estão ali muitos pequenos detalhes e o Inglês nem tanto e se calhar ao aprender em Inglês simplifica um bocadinho a matéria #fica mais concisa# mais prática e e é mais fácil de de #compreendê-la# em Inglês e de de aprender [mas isto pode depender do facto de não dominarmos o Inglês de não sermos nativos] Sim. Ach- eu sei que por exemplo para para alguns #alunos da minha turma# isso que eu vi que é mais fácil aprender em Inglês do que em Português se calhar #é surreal# e não sentem o mesmo […] e achavam as aulas mais fáceis em Português do que as em Inglês isto também deve ser que um bocadinho ao #facto de eu dominar o Inglês# se não se calhar também tive muitas mais dificuldades [se calhar desconhecemos termos mais complexos mas SIM uma língua estrangeira ajuda no exercício da síntese]
fsEcn_9	As com o Inglês eram mais interessantes e fazíamos mais jogos e eram mais. Didáticas e interativas [A disciplina] era a mesma mas em Inglês […] Acho que acaba por ser interessante e ficamos mais atentos e com mais vontade de aprender #por ser diferente# É mais fácil aprender em Português [que em Inglês para mim] ainda nos dá mais trabalho e é mais difícil envolve mais #mais trabalho da nossa parte# […] eu no início tinha que estar a traduzir praticamente tudo pra #para Português# para entender porque eu tinha #dificuldades# e depois já é quase a mesma coisa quando estamos mais à vontade com o Inglês mas no início dava muito trabalho […] O 9º ano já era praticamente a mesma coisa .. Tanto que gostei já tinha um MUITO em Inglês já nã- no 7º ano era tipo #ligar# assim coisinhas mais simples XXXX no 9º ano já era composições mesmo em Inglês XXXX matéria […]
fsHum_10	[…] Nós tivemos uma professora de História que basicamente era a mesma coisa tanto em Inglês como em Português. Usava sempre os mesmos recursos ahm agora tivemos uma que era. Diferente. Na maneira de ensinar em Português e outra em Inglês […] uma professora durante dois anos e outra no final do ciclo […] tinha mais. Mais expressividade em falar Inglês. Mas ela apesar de ter algumas dificuldades na língua conseguia expressar-se da melhor forma. Em Inglês.

	Porque em Português acaba […] por ser uma matéria muito puxada. Até porque foi ahm uma matéria mais para decorar e. A professora assim tinha *essas coisas mas* […] acabava por dizer as coisas talvez por ser um vocabulário mais simples mas #nós compreendíamos melhor# […] Ahm .. Pronto a professora também apesar de ter dificuldades em Inglês ahm expressava-se bem porque também acho que essas dificuldades ajudavam com que ela facilitasse. Um bocado .. A expressão das frases das coisas ficava mais simples […] Que eu me lembre acho que usmos algumas alguns recursos da Internet porque se por exemplo estivemos a dar #Revolução Americana# ahm nós se escrevemos mesmo na Internet Revolução Americana em Português não aparece quase basicamente nada <<uhm>> e é mais curioso. Se escrevemos em Inglês aparece muita matéria muito pormenor muita ahm fica mais pronto aprendemos mais sobre. #Revolução Americana# […] É assim quando a professora tivesse alguma dificuldade ela acabava por nos perguntar como é que podia. *Conjugar aquele verbo dizer aquela palavra* e isso acaba também por ter uma interação #entre professor e aluno# isso também ajuda bastante a a decorar aquel- o que é que seja <<hm>> e. […] Sim ela tinha MAIS interação no Inglês do que o Português [o pedir mais a vossa ajuda] sim ela. Perguntava mais era um facto […] (Sorri) eu até aumentei as minhas notas nessa nessa fase […]
fsSci_11	[…] Em termos de matéria eu acho que era ahm ligeiramente igual .. As professoras ahm mas a professora de História em Inglês […] a nossa primeira professora […] tinha passado algum tempo em África do Sul […] já tinha nascido com a língua […] nunca houve assim muita diferença em termos de linguagem com as duas professoras […] foi ahm ligeiramente mais complicado porque a professora [de História do ano a seguir] não estava habituada a falar em Inglês [mas] mesmo sozinha a professora de História conseguia fazer normalmente as atividades [e] Havia mais interação com os alunos na maneira de dar em Inglês porque havia mais atividades havia mais filmes. Mais maneiras de interagir. Em Português era mais à base de livros XXXX de estudar […] […] há muita mais informação em Inglês do que em Português ahm. Acho que é basicamente isso só nós captamos a informação que há em pronto disponível na Internet e em livros e outros materiais [não é isso que te estou a perguntar é sobre a tua maneira de aprender] eu acho que era ligeiramente mais fácil em Inglês porque até as professoras de vez em quando necessitavam de utilizar uma linguagem mais #menos técnica# em Inglês. Para passar o a ideia para os alunos […] Eu também acho que o Português é uma língua muito mais. Difícil por si só porque nós usamos muitas palavras específicas palavras enquanto que os Ingleses usam mais frases para explicar o sentido [mas isto pode depender de nós não sermos nativos] precisamos mais de explicar frases do que só usar as palavras em si para XXXX o significado <<uhm>> e acho que isto passava muito para as aulas […] Hm. Sim as professoras a professora de História tentava de ex- simplificar #o máximo que podia# para não tivermos muitas dificuldades a saber a matéria […] eu nessa altura XXXX boas notas em História mas acho que melhorei muito nessa altura do Inglês

d. BENEFITS IN TERMS OF SUBJECT AREAS (3 AND 8)

STUD	QUOTATIONS
fsSci_1	A mim naquela altura o qu- a que mais beneficiou foi a de História não é? […] depois também […] chegamos a ter Matemática chegamos a ter Ciências e Físico-Química mas na altura o que beneficiou mesmo foi. História […] porque deu-me umas notas excelentes eu percebi muito mais e o Inglês técnico consegui trazê-lo para para a vida real às vezes chegava a casa e dizia olha aprendi uma palavra nova e quando a ouvia já já não precisava de perguntar #o que é que significava# e ahm muito muito desse desses conhecimentos foram passados para a vida real porque nós me- não tínhamos como eu disse no início só aquela coisa da gramática da estrutura de como é que se forma a frase como é tínhamos mesmo ahm sabíamos como fazer um uma um diálogo. Eloquente um diálogo estruturado bem bem feito e conseguíamos perceber o que as outras pessoas diziam <<hm>> mas em termos de disciplina foi mesmo História <<ok>>. No secundário ajudou MAIS em Inglês porque […] temos conhecimentos muito mais avançados do que de uma situação normal das aulas normais […] Inglês técnico […] é mais ahm coisas de de por exemplo de História nós aprendemos coisas mesmo específicas de História Ciências aprendemos coisas específicas de Ciências […] mesmo na universidade hoje em dia aprende-se #Inglês específico para essa coisa# […] se calhar se fosse com o Inglês normal não conseguia explicar muitas coisas que possam a ver com o Inglês de História […] Eu acho que sim porque […] algumas coisas que nós estávam- ahm a relacionar com História tinham a ver com Ciências nem que fosse só o nome do lenço que naquela altura causou o nome dos instrumentos […] em evolução aprendemos instrumentos utilizados na Medicina na Astronomia e na Matemática nós aprendemos todo muit- muitas coisas que podem ser aplicadas também em Ciências e agora se calhar é mais fácil para nós quando aparecem no livro em Inglês ou mesmo na Internet em Inglês nós já sabemos o que é e. É muito mais fácil integrarmos estes conhecimentos #para o que nós estamos a fazer# […] vou lá à procura na Internet e eu procuro informar-me em sites ingleses e consigo perceber tudo aquilo que está li porque aqueles instrumentos nós já demos ah eu lembro-me que dei isto no 9º ano ah eu lembro-me que dei isto no 8º ano […]
fsSci_2	História sim sem dúvida porque nós aprofundávamos bastante certos temas que eu posso dizer que #até hoje ficaram na minha memória# [em Português] Sim aprofundavam-se mas […] também acho que isto se deve em parte à professora

	que nós tínhamos que também nos aj- fez um um excelente acompanhamento mas nós como tínhamos aquela hora extra […] quando nós estávamos a explorar os temas em Inglês <<hm>> nós por exemplo nesta hora extra explorávamos temas de História que ficavam #mais explorados# […] também nós tivemos aulas de Ciências em Inglês chegamos a ter uma ou duas <<ah>> e e depois também #isso cativava# porque era diferente […] estavam as duas professoras presentes <<hm>> a professora de Ciências e a professora Eng-old […] Porque nós também fazíamos […] por exemplo nas aulas de Ciências eu recordo que nós tivemos uma aula sobre Educação Sexual e em parte foi em Inglês ahm e depois as pessoas também havia certos conceitos isso que nós não sabíamos muito bem e então as professoras estavam lá e ajudavam e. De uma certa forma estávamos envolvidos no tema mas é claro que mesmo as aulas em Português […] Achava também sempre cativantes e e interessantes Sim porque nós tínhamos muita metod- metodologia nós adotamos muitos métodos mesmo de estudo <<ah!>> Porque. Nós no início do ano eram-nos dados sempre umas folhinhas para nós ahm pormos o estudo tudo organizado e o facto de nós ahm estarmos habituados a fazer este método depois #ajudou-nos no futuro#. E nós também fazíamos coisas diferentes e éramos obrigados muitas vezes a dar asas à nossa imaginação. Obrigados entre aspas <<uhm>> era-nos pedido <<hum>> e era-nos pedido que criássemos coisas era-nos pedido que respondêssemos a certas coisas que as outras pessoas #se calhar não faziam isso nas ditas turmas normais# <<hm>> porque nós por exemplo eu lembro-me de uma peça de teatro nós fizemos e que nós nós adaptamos […] também nos deixou com o à vontade perante as outras pessoas e isto também. Melhorou a nossa capacidade oratória por exemplo que no secundário pede-nos muito isso porque nós temos que fazer #apresentações orais# […] sim mesmo que seja em Português porque o à vontade ahm nasce também deste tipo de situações […] até mesmo a viagem que nós fizemos no final do 9º ano[…] deu-nos um sentido de responsabilidade porque parte muit- grande parte do dinheiro que nós conseguimos para a viagem fomos nós que #que o arranjamos# fomos nós que TIVEMOS ideias para arranjar dinheiro fomos nós que cozinhávamos bolachinhas para vender. […] e claro que #nós também crescemos# com tudo isto <<hm>> e claro que isso foi uma boa preparação para os anos futuros […] porque o método acaba por ser quase independente da língua <<hm>> o método está. Está dentro de nós entre aspas […] vamos sempre
fsSci_3	[…] por exemplo História. Nós ahm eu dava até ao 6º até ao 6º ano mas de uma forma muito metódica muito. Muito aborrecida e o projeto ahm tínhamos História de uma forma mais dinâmica e as próprias aulas eram muito mais ahm de diálogo e ahm a professora ensinava de uma forma diferente […] a professora que tinha an- antes de do projeto ahm era capaz de estar #a falar# e ela só a #ler o manual# e a a escrever #no quadro#. No projeto era diferente tínhamos #víamos vídeos# a professora exprimia-se de uma forma diferente ahm fazíamos as tais representações relacionadas com a História […] e apresentávamos aos pais e. E sempre com a vertente da História […] e assim entre- interligávamos o Inglês com a História de uma forma #muito mais desenvolvida# e. E que me captava mais a atenção […] Desenvolvia as minhas *funç- ahm a ahm minha língua no Inglês ahm* XXXX como eu já tinha explicado houve ahm vocabulário que nós também íamos aprendendo porque nós também tínhamos uma disciplina que era a Educação Cívica que era onde nós tratávamos de dos problemas da da turma e também tínhamos mais tempo para o projeto #em si# <<hm>> e e depois optamos também por ter algumas ahm aulas (sorri) de Ciências em Inglês e ahm e dá-nos uma ideia mais geral e mais abrangente do que a matéria só em si ahm conseguíamos ter uma área #mais alargada# da matéria nã- não era só aquilo que dizia o manual […] nós tínhamos ahm o vocabulário era muito mais desenvolvido e mui- ahm em vez de ahm uma frase simples ahm no manual nós conseguíamos pegar nesta frase e desenvolver ahm e e #e pesquisar mais sobre este assunto# nã- não ficávamos só por ali que- queríamos. Explorar mais Ahm n- eu deixei de ter História […] com pena minha […] ainda hoje quando vamos a visitas de estudo relacionadas com monumentos com a História com Arte há muita coisa que que os guias falam que #nós vamos relembrando# porque a professora deu tão bem ahm a Arte e também que ahm somos capazes de nos ir XXXX de algumas coisas. Nas Ciências em si ahm uma um outro vocabulário que nós aprendíamos ahm por exemplo sei que em Físico-Química. Ahm porque agora e depois também em Biologia eram as duas áreas que agora se calhar me dão ahm que o Inglês me deu mais #experiência# <<uhm>> ahm e também sei que no secundário nós chegamos a ter uma a professora de de Biologia ela dava-nos muitos vídeos em Inglês <<uhm>> ou seja o Inglês que nós tínhamos aprendido #ajudava-nos nesse ponto# <<mesmo que fosse aprendido em História>> exatamente! […] e ver um simples vídeo em Inglês já para mim já não era em branco já conseguia retirar alguma informação de lá […]
fsEcn_4	Ahm. O o Inglês foi aquela mudança que ainda hoje ahm optei como segunda disciplina no meu curso é o Inglês .. O Inglês agora vai ficar para sempre para sempre (ri) ahm. Mas digamos História. História XXXX foi naquela altura também uma grande alteração mas gostei muito mais #de estudar História em Inglês# […] é diferente parece que estamos em outro país digamos. […] Inglaterra por exemplo estamos a dar #aquela disciplina naquela língua# [História em Português] Ahm era muito monótono dar sempre as mesmas coisas ahm ano após ano <<uhm>> na disciplina de História. Digamos no 5º e no 6º ano. E quando nós entramos no 7º nós tivemos de nos adaptar àquelas novas mudanças para ahm acontecendo com a língua porque palavras que não eram iguais e gostei mais não sei explicar melhor [...] Vocabulário […] Não digo em Matemática mas em Economia nós te- temos no 12º no 11º ano ahm matérias que eram sobre leasing e franchising <<uhm>> e isso não existe tradução em Português (sorri) é leasing e franchising e #nós temos que entender aquilo# e nós ao já sabermos isso do do trabalho do English Plus dá para XXXX […] em Matemática não houve grandes

	ahm adaptações diferenças nenhumas […]
fsEcn_5	Acho que foi o Inglês porque nós XXXX o 9º ano e a nossa professora dava-nos #testes de 11º# que eu o ano passado fiz testes muito mais fáceis do que #estava a fazer no 9º ano# […] Sim sim os testes eram ahm mais complicados para nós e isto era bom <<uhm>> mas melhoram notas na mesma […] a gramática nós no 9º ano já demos quase a matéria toda já nem dei quase nada agora no secundário e agora no 12º ano o rephrasing os exercícios de rephrasing que eu estou a fazer fazem mais difíceis no 9º ano <<uhm>> agora só por exemplo passive voice e isto sim que é mu- muito fácil estamos a fazer agora este ano […] Ahm acho que não .. A disciplina continua a mesma o Inglês não nos ajudava na Matemática por exemplo <<não vos ajudou?>> Co- como é que poderia ajudar? Porque nós estamos a falar Inglês […] no 8º ano nós tivemos umas aulas de In- de Matemática em Inglês porque a nossa professora de Matemática naquela altura também quis tentar e deu-nos umas aulas e por acaso também foi interessante mas nã- em Português era mais fácil […] Sim a Matemática é diferente porque a Matemática em Inglês eu não percebia grande coisa e tinha aqueles te- termos técnicos muito mais diferentes e complicados
fsSci_6	.. Foi pronto foi História […] Pronto ao princípio como disse tinha um bocado dificuldade […]. No vocabulário […] em Inglês. Ah mas depois foi aprendendo novas palavras e novas formas de dizer as coisas e. Cheguei ao final do 9º ano a achar que era mais fácil fazer História (sorri) em Inglês do que em Português […] Sim ahm muitos dos artigos que nós usamos às vezes para fazer trabalhos e mesmo para estudar estão em Inglês e acho que foi importante. O projeto por permitir-nos #agora ter mais facilidade a compreender# aquilo que precisamos de saber agora nas matérias
fsSci_7	Para mim foi sem dúvida História porque eu nunca tive assim um interesse gigante <<uhm>> em na nas matérias História e o facto de a darmos em Inglês tornou sempre .. Tornou sempre a disciplina mais interessante e diferente das outras e levou-nos a criar ahm dar História porque era diferente era em Inglês éramos os únicos a ter naquela altura e obviamente sentimos especiais e ahm gostávamos de aprender a matéria não só ahm sabíamos os vocábulos todos em Inglês #que as outras turmas não sabiam# e e gostávamos e e obviamente ahm sentíamos que éramos diferentes dos outros. Nessa altura e estávamos um pouco mais à frente ahm e gostávamos disso e continuamos assim […] História […] que com o Inglês ajudou-me a compreender e a perceber e […] se fosse só em Português […] não ia a ser tão fácil ahm puxar os alunos para perceberem a matéria e para para que todos estivessem ahm unidos a tentar perceber juntos. […] Facilitou-me como estudante porque me permitiu ver melhor as coisas permitiu ir para vários locais visitar vários ahm <<uhm>> várias escolas vários ahm vários acontecimentos […] me foram também despertando para para gostar mais desta área. De Ciências e portanto se calhar foi a única e foi um projeto que que nos incentivou sempre a melhorar as nossas capacidades e portanto quando chegamos a a escolher nós #é fácil nós passarmos para Ciências#. […] nós vemos as Ciências como a disciplina mais mais difícil […] nós vemos sempre como um desafio ahm #ir para a coisa mais difícil# e se calhar tal como como fomos por exemplo neste projeto que era o ahm mais difícil naquele momento para nós e conseguimos ultrapassá-lo também ahm incentivou-nos a ir para as Ciências porque também era naquela altura ahm a escolha mais difícil que podíamos fazer <<uhm>> e ahm incentivou-nos a trabalhar mais para ficarmos sermos melhores
fsEcn_8	Inglês mas <<e porquê?>> Porque através da matéria de História o nosso vocabulário ficou #muito mais enriquecido# e penso que foi isso também no nos debates e nas peças de teatro #que nós íamos fazendo# nas atividades ahm acabávamos por desenvolver uma uma fluência muito maior em Inglês […] gostava que o English Plus tivesse durado <<uhm>> até ao 12º porque eu sinto que neste momento o Inglês que eu tenho no secundário. É muito inferior ao que tinha se calhar no 7º ano e. Sinto agora que não tenho tanta facilidade a falar em Inglês como se calhar até tinha antes […] no English Plus falávamos todas as semanas tínhamos ali um grande contato. Mesmo com a embaixada de Estados Unidos tínhamos um grande contato com o Inglês e agora […] a própria disciplina de Inglês do 12º não é tão. Pronto não é tão exigente nós tính- ainda tivemos Inglês com a professora Eng-old no 10º e 11º só que é completamente diferente porque primeiro não temos tanto tempo de Inglês e […] não é a mesma matéria #é uma matéria mais simples# mais banal que #já falamos muito muitas vezes# […] Ahm na Matemática nem tanto no Português também não mas ahm na Geografia <<hm>> o projeto ajudou-me muito porque qua- quando nós fazíamos desenvolvíamos aquelas atividades e mesmo a própria História ajuda-nos a compreender muita coisa que se passa no presente e muitas coisas que agora nós estudamos hoje em dia por exemplo na Economia e na Geografia ahm quando falamos por exemplo da União Europeia e da de coisas relacionadas com a política ahm e acontecimentos históricos […] o projeto ajudou-me bastante porque desenvolvemos aquelas atividades todas que nos fizeram aprender mu- muito melhor aquilo que tínhamos que aprender tanto em História como em Inglês <<uhm>> ou até em Geografia [mesmo sem o projeto estudava História na mesma] mas eu penso que […] não tinha tanto gosto pela matéria que aprendi não a não não a sabia até hoje <<hm>>. Acho que nós abordávamos a matéria de uma forma diferente e ahm não era aquilo decorar que […] vomitamos no teste entre aspas e e acabou não. Nós lá fazíamos co- através de teatros #são coisas que acabam por ficar# […]
fsEcn_9	Foi. História […] porque aprendemos aqueles conceitos então tipo tínhamos que estudar praticamente o dobro tínhamos que estudar em Português depois tínhamos que estudar também em Inglês e XXXX estudava tipo os dois e

	acho que beneficiou muito neste aspeto porque tí- envolvia mais estudo […] N- no meu curso não. Acho que não no meu curso […] Já não tenho Geografia agora so é Economia […] Ai nã- tinha era igual XXXX na Matemática não atuava em mim. Na universidade vais ser uma grande ajuda porque está tudo em Inglês
fsHum_10	[…] realmente foi a de Inglês. […] que teve mais relevância […] Ahm. Por exemplo em Inglês ajudou-nos a a a abrir um bocado a nossa o nosso vocabulário. […] Ajudou-nos. Tanto a escrever como no na oralidade. Até porque no fim nós acabamos por ter uma visita de estudo e aprendemos também como é que era como é que as pessoas se expressam mesmo no país <<hm>> não te-#não é a mesma coisa# […] E na História por-. Eu pessoalmente decoro mais as coisas se forem numa língua estrangeira se for em Português é muito maçador estou ali sempre ahm é uma língua que eu conheço é uma matéria secante (ri). A História é assim um bocado. Puxada para decorar o que é que seja e ahm em Inglês como nós também tínhamos teatro e essas coisinhas essas atividades e foi decorando basicamente com o Inglês Eu acho que não porque eu também nunca tive cada peças (sorri) a essas matérias eram para mim Físico-Química Ciências nunca foi a minha área […] Não. Eu tive foi uma espécie de Matemática que era mais fácil. Mas o Inglês não entrava nesse tipo de Matemática […] Não não me ajudou naõ (sorri)
fsSci_11	Eu acho que era que era História que beneficiou mais […] Porque havia mais ahm atividades interessantes em naquele projeto. […] era mais engraçado nós aprendermos em Inglês do que em Português […] tenho agora certas disciplinas que se calhar eram mais interessantes em Inglês do que se fossem em Português […] […] Em parte nisso de de haver mais recursos em em Inglês […] Biologia e Geologia. O problema é que de vez em quando era muito técnico e ai é que dava jeito (sorri) a professora de História simplificar as coisas. […] normalmente há muita mais informação em Inglês .. Que nós XXXX muito nessas nessas áreas não temos muita informação ahm .. E acho que foi também a base de documentários os documentários normalmente quando se via Discovery Channel e isso tudo. Estavam. Normalmente estavam todos dobrados dobrados ou com legendas mas de vez em quando apanhava alguns que não eram […] Se tudo correr bem (ri) [na universidade vou] para Informática <<Informática>> que também é muito à base de Inglês […]

H – Categories and coding of open-ended answers to current student Questionnaire

a. categories and coding of answers* to q6 in the questionnaire (content analysis)

A) media through which information is achieved, digital or not;
B) visits (school trips or with families) in cultural institutions and natural environments;
C) other contexts, that might be related to either commercial or educational circumstances.

CATEGORIES	Coded 7th grader answers (q6): contexts of Science with English	Coded 8th grader answers (q6): contexts of Science with English	Tot Ctx SCI+EN (q6)
A) Information media	**a.** television (10). Ex.: • *na televisão vejo que praticamente todos os cientistas são Ingleses* • *telejornal* • *em vários tipos de decomentarios onde posso saber mais sobre tudo* • *programas da televisão* • *a televisão no canal 120 (discovery chanel) fala sobre várias coisa de ciencias mas em inglês* • *só em comentarios na televisão em inglês nos canais sobre ciências* **b.** printed material (3). Ex.: • *revista National Geographic* • *em livros* **c.** Internet (2). Ex.: • *em alguns sites, enquanto fazia algumas pesquisas* • *foi num video que vi na internet em casa*	**a.** television (22). Ex.: • *na televisão, em canais estrangeiros, por exemplo* • *em casa quando vejo os programas ingleses e americanos na televisão. Quando vejo programas sobre a ciência encontro palavras que aprendi na escola* • *nos documentários científicos encontrei muitos nomes de diferentes espécies em ingles* • *em anúncios plublicitários e em noticias* • *quando vejo filmes científicos ou documentários que não estejam traduzidos...* • *por exemplo no canal chamado national geographic existem programas em inglês que falam de ciências* • *a ver national geografic é importante sabermos os termos corretos para percebermos* • *documentários **ingleses** em canais **internacionais*** • *quando vejo um programa cientifico na televisao em ingles* **b.** printed material (4). Ex.: • *informações presentes nas enciclopédias* • *em revistas científicas, […], jornais,...* **c.** Internet (1). Ex.: • *sempre... […], nos sites de internet*	**a. television** 32 **b. paper** 7 **c. internet** 3
	15	**27**	**T = 42**

B) Visits and tours	**a.** Science museums (3). Ex.: • *pode distinguir as variedades de rochas que existem na La-Salette por exemplo* • *quando visito museus e a visita é em inglês* • *nos museus de ciências* **b.** natural parks or zoos (3). Ex.: • *eu estava de férias e fui a um parque de plantas e como havia muitos turistas o guia estava a explicar as coisas em inglês* • *foi quando nós fomos ao Arouca Geopark* • *na Natureza, nos parques com: nomes de plantas, nomes de animais.... Muitos deles aprecem em Inglês e as plantas têm a ver com a Ciência pois podem ser de vários tipos* **c.** visits in general (3). Ex.: • *quando vou para um país estrangeiro e vou fazer uma visita guiada e o orientador faz uma pergunta a haver com Ciências e nessas ocasiões que tenho que usar o Inglês e as Ciências* • *quando fui a uma visita de estudo havia muitos nomes de plantas em Inglês* • *fui a um evento de ciências em inglês, que tínhamos de responder a perguntas em inglês*	**a.** Science museums (3). Ex.: • *nas rochas e nas outras matérias por exemplo nos museus estrangeiros* • *quando vou de férias a Inglaterra nos museus as placas em que explicam certas coisas estão em inglês* • *em alguns museus aparecem, no que está exposto, os nomes em Inglês* **b.** natural parks or zoos (2). Ex.: • *no jardim zoológico* • *quando vamos a entrar numa floresta e aparece um sinal em inglês* **c.** visits in general (1). Ex.: • *quando fui a Inglaterra e vi um homem a explicar a origem da Terra*	**a. museums** 6 **b. parks/zoos** 5 **c. visits** 4
	9	**6**	**T = 15**
C) Other contexts	**a.** commercial contexts (1). Ex.: • *nos hortos local onde se vende produtos haver com as plantas e não só, os sacos apresentados a classificar o mesmo tem sempre também traduzido para Inglês* **b.** school-related topics (3). Ex.: • *no centro de estudos e em casa* • *trabalhos de outros colegas...* • *quando os meus pais me perguntam o que é que eu estive a dar na escola*	**a.** commercial contexts (9). Ex.: • *medicamentos* • *muitas vezes os rótulos dos medicamentos têm termos científicos que desconheço em Português, mas que sei em Inglês* • *caixas comerciais (brinquedos, jogos,...) relacionados com ciências, com as respetivas descrições em Inglês* • *jogos educativos* **b.** school-related topics (3). Ex.: • *estava em casa e de repente a minha diz me: - Andas a aprender o Espontaneismo em Inglês. - Sim mãe é Spontaneism. - Ah eu lembro- me de dar isso na escola* • *já estive com os meus amigos a passear na cidade e estava-mos a falar de uma matéria*	**a. commercial** 10 **b. school-related** 6

		constituída por células e eu disse o nome da célula em inglês • *porque as vezes durante o dia como vivo numa casa entram lá animais e o nome cientifico deles e em ingles*	
	4	**12**	**T = 16**
NOT EXPERIENCED	5	3	8
NOT KNOWN	0	3	3
NOT GIVEN	2	0	2
UNCLEAR AND IDIOSYNCRATIC	• *nas tecnologias* • *english plus* • *em concursos* • *já encontrei as Ciências ligadas ao Inglês pois muitos processos em ciências têm nomes ingleses* • *marble* • *em casa, na terra da minha avó..* • *ás vezes já encontrei Quartzo em minha casa* • *pude distinguir as variedades de rochas na natureza* • *nos tsunamis e terramotos mas nunca aconteceu no meu país* • *a ir a pé para casa, descobri quais as pedras que eu pisava no chão, e nunca dava grande importância até hoje saber como "nasceram" e se formaram* • *por exemplo com amigos não portugueses tive de utilizar o inglês para conseguir contactar com eles*	• *acho que está tudo um pouco ligado as ciências. Tal como a matemática, a ciência está sempre no nosso dia-a-dia* • *estudo dos fósseis encontrados recentemente nos países estrangeiros* • *na Ciência no estrangeiro ;)* • *pedras, plantas e Sol* • *as rochas, os animais (os seus comportamentos e onde vivem). As células, e micro-organismos* • *como tenho um campo de cultivo e uma espécie de mato observo varios animais durante o dia e a noite* • *posso encontrar alguns vestígios em Inglês* • *quando falo com a minha mãe em inglês*	11+8

* mistakes have not been corrected

b. categories and coding of answers* to q9 and q10 in the questionnaire (content analysis)

A) integrative dimension, showing how learning (q9) and knowing (q10) languages enhances one's knowledge, through enabling communication and sharing with other (known and unknown) people – both at home and while being on holidays or travelling in general – and also enabling students to access and enjoy (foreigner) literature, music or audiovisuals; the interest for being exposed to or developing the language itself has also an integrative connotation;
B) instrumental dimension, in which languages and communication are functional in everyday life, for working and studying (at home or abroad) or having to live/work abroad in case of emigration and for one's future in general;
C) cognitive component which "concerns the individual's self-appraisal of what (s)he can or cannot do", here related to (being able to speak) a specific language.

CATEGORIES	Coded 7th grader answers (q9): importance of Language learning	Coded 8th grader answers (q9): importance of Language learning	**tot Imp FL (q9)**	Coded 7th grader answers (q10): positive aspects of English	Coded 8th grader answers (q10): positive aspects of English	**tot Knw EN (q10)**
A) Affective and cultural	**a.** contact with people (11). Ex.: • *estar com alguém estrangeiro* • *precisar de falar com estrangeiros* • *temos que entender o que as pessoas estrangeiras dizem, escrevem, etc.* • *para falarmos com pessoas de outras culturas* • *podemos comunicar com pessoas de outro país* • *contactar com pessoas de outras línguas* • *cada vez mais também existe emigrantes* **b.** travelling (10). Ex.: • *se for viajar* • *vamos a viagens para outro país* • *ir de férias para outro país* • *em viagens*	**a.** contact with people (8). Ex.: • *ajuda-nos a ter uma melhor relação com o "estrangeiro", conseguimos comunicar com pessoas estrangeiras, […]* • *é uma boa maneira de comunicar com pessoas de diferentes culturas* • *em contatos* • *podemos ter que lidar com pessoas de outras nacionalidades* • *são a forma que temos de contactar com pessoa de outras nacionalidades que não falem português* **b.** travelling (14). Ex.: • *se viajarmos podemos falar com as pessoas* • *podemos precisar nas férias* • *se viajarmos para outro país*	**a. contact** 19 **b. travel.** 24 **c. knowl.** 16 **d. enter.** 3	**a.** contact with people (10). Ex.: • *falar para as pessoas* • *as comunicações com as pessoas e interatividade* • *quando saio da escola e ouço pessoas a falar Inglês e percebo e até posso interferir na conversa* • *como é uma língua universal é mais fácil de comunicar com os estrangeiros e pessoas nossas conhecidas que passem muito tempo comigo* • *quando vêm primos meus inglês cá eu conseguir ter uma conversa com eles* • *falar com os meus pais e irmãos* • *aprender a comunicar com os professores e com os meus colegas e amigos* • *poder comunicar com pessoas*	**a.** contact with people (8). Ex.: • *gosto de falar e comunicar com as pessoas para melhorar o meu inglês* • *poder falar com pessoas estrangeiras e poder aprender sobre a sua cultura* • *posso comunicar com pessoas estrangeiras percebendo o que elas dizem e elas percebendo o que eu digo* • *utilizá-lo para falar e praticar com os meus colegas* • *conseguir (às vezes) comunicar com os colegas e os professores* • *comunicar com os amigos de forma diferente* • *eu gosto mais de conversar com os mesu colegas em Inglês*	**a. contact** 18 **d. enter.** 41 **e. language** 22

- *quando fossemos para o estrangeiro não conseguia-mos comunicar com os outros*
- *quando quisermos sair fora do país*
- *se formos para qualquer lado é mais fácil de comunicar com eles*

c. broader/richer knowledge (7). Ex.:

- *para podermos evoluir na sociedade e sermos um dia alguém importante*
- *ter um maior desenvolvimento*
- *para o nosso futuro e conhecimento*
- *uma forma de nos "abrir" a outras coisas*

d. entertainment (0)

por motivos de [trabalho ou] lazer

- *podemos usar as línguas para comunicar com pessoas, também é útil para turismo/férias.*
- *para as viagem que fazemos para fora do pais*
- *se viajarmos para fora de Portugal, necessitamos de saber falar outra língua para assim poder comunicar*
- *[…], podemos viajar mais "seguros" (seguros das nossas capacidades,pois sabemos que vamos conseguir comunicar), […]*
- *se formos a algum país e precisarmos de pedir ajuda*
- *se formos para outro pais devemos comunicar e é perciso saber outras línguas*

c. broader/richer knowledge (9). Ex.:

- *contribui para o nosso desenvolvimento pessoal e mais tarde profissional*
- *para o nosso futuro e para a nossa educação ao longo da vida*
- *pode promover mais cultura geral e até um bom futuro*
- *melhora os nossos conhecimentos*
- *ajuda nos a aprender mais sobre outras culturas*
- *contribui para o desenvolvimento da nossa cultura*

d. entertainment (3). Ex.:

- *[…], para entender músicas de outras línguas, […]*

nos jogos que jogo

- *falar em Inglês (no computador)*
- *os meus jogos quando jogo no meu tablet falo com players em Ingles pois maior parte nao sabe português*

d. entertainment (18). Ex.:

- *o entretenimento (televisão)*
- *cantar*
- *as músicas em Inglês*
- *poder compreender filmes séries e vídeos em inglês*
- *ouvir canções e perceber o que dizem*
- *ouvir as minhas músicas favoritas inglesas e compreender perfeitamente cada palavra que é dita*
- *os jogos de computador*
- *ver filmes ou séries, que é o que eu mais faço no meu dia-a-dia em casa*
- *com ajuda dele posso perceber o que quer dizer as expressões em séries de televisão, filmes etc.*
- *o facto de conseguir ver um filme e nem sempre recorrer às legendas*

e. the language itself (12). Ex.:

- *as suas diferentes variantes de acordo com o vocabulário e gramática*
- *a pronuncia Americana*
- *o sotaque dos ingleses*
- *a pornuncia*
- *comunicar*
- *falar com a língua*

d. entertainment (23). Ex.:

- *das series*
- *poder escutar musicas em inglês e perceber a sua mensagem*
- *os filmes do cinema*
- *poder entender programas de televisão, series, filmes sem precisar de legendas*
- *a letras das músicas, porque muitas vezes em Inglês as músicas têm outro sentido e dá-me mais vontade de ouvi-las*
- *conseguir perceber os filmes, músicas e livroa que vejo e leio*
- *ver filmes, ou series em que inglês seja a língua falada pelas personagens*
- *poder perceber filmes e livros em inglês*
- *ouvir musica*
- *a forma como me é util no dia-a-dia para compreender todas as musicas, ver todos os videos e jogar todos os jogos sem nenhuma dificuldade em os compreender*
- *ver televisao*
- *ler livros, revistas, e ver filmes tambem em inglês*
- *a língua inglesa nos desportos*
- *quando vou ao cinema eu acho mais interessante ver filmes em ingles do que em portugues. Mas tambem em livros porque quando estamos a ler livros em portugues cansamo-nos rapidamente*

e. the language itself (10).

		• *para ler literatura estrangeira e para muitas mais coisas* • *para poder ver filmes ou ouvir musica sem ter que usar legendas*		• *tentar aprender a falar e escrever* • *a forma como as pessoas o falam* • *é aprender o vocabulário* • *as palavras novas e diferentes que aprendemos que não tem nada a haver com a nossa língua e também porque há muitas palavras que se diz igual tanto a inglês como a português* • *as aulas* • *ingles*	Ex.: • *praticar a comunicação em Inglês* • *usa-lo* • *falá-lo* • *o seu vocabulário* • *a leitura, a escrita e o falar* • *adoro a forma de falar o inglês e adoro fala-lo* • *escrever* • *pessoas de outros países a falarem ingles* • *as aulas* • *atividades feitas em ingles*	
	28	**34**	**T = 62**	**40**	**41**	**T = 81**
B) Pragmatic and functional	**a.** people who emigrate (9). Ex.: • *ir para fora trabalhar* • *se tivermos de ir para o estranjeiro* • *emigrar ou simplesmente trabalhar* • *ir estudar / trabalhar para o estrangeiro* • *mudarmos de país para ir trabalhar* • *podemos imigrar e ter de falar outra língua sem ser o português* • *se formos mais tarde trabalhar para o estrangeiro* **b.** getting a job (6). Ex.: • *temos mais hipóteses de arranjar emprego* • *conseguir-mos um emprego melhor* • *é muito mais fácil de nos contratarem* • *futuramente para arranjar um emprego ou até mesmo cargos*	**a.** people who emigrate (15). Ex.: • *hoje em dia existe muitas pessoas a emigrarem para arranjar emprego,* • *se decidir emigrar* • *podemos querer, ou ter, que ir viver ou trabalhar para outro país* • *podemos conseguir uma proposta de trabalho num país estrangeiro* • *cada vez mais as pessoas vai emigrar para o estrangeiro* • *morar para lá saber a língua* • *um dia podemos precisar de sair do nosso pais* • *quando formos mais velhos pudemos não encontrar trabalho na nossa região e termos de ir para fora trabalhar* • *se tivermos de algum dia ir trabalhar ou estudar para fora do país*	**a. emigr.** 24 **b. job** 10 **c. work** 8 **d. study** 7 **e. day** 5 **f. future** 11	**e.** everyday use (1). Ex.: • *podermos entender as palavras em inglês que nos aparecem cada vez mais não só na internet como também em palavras do dia-a-dia*	**e.** everyday use (6). Ex.: • *o vocabulário que nos deixa obter mais informação, porque agora todos os estabelecimentos falam\escrevem em inglês!* • *o facto de ser mais preciso em tudo como na televisão computador em tudo* • *a maneira de como podemos usar lo em certas situações* • *as portas que me abre para o futuro* • *o facto de em quase tudo o que se compra vem com algo em Inglês e também porque cada vez mais se faz compras pela Internet e a maior parte dos "sites" são em Inglês* • *pouco usado, mas referenciado quando preciso*	**e. day** 7

boas em empresas

c. use at work (3). Ex.:

- *no futuro quando trabalharmos vamos precisar*
- *em determinados empregos*
- *para trabalhos*

d. studies (4). Ex.:

- *querer ir estudar ou trabalhar para o estrangeiro*
- *se quisermos seguir turismo*
- *ir estudar para fora do país*
- *quando formos grandes e formos estudar para fora se não ficarmos sempre é mais fácil para entramos*

e. everyday use (2). Ex.:

- *mesmo no dia a dia. Em trabalhos, na internet*
- *no nosso dia-a-dia elas estão bem presentes*

f. one's general future (6). Ex.:

- *pode ajudar-nos num futuro próximo*
- *vai me ajudar para o meu futuro*
- *no nosso futuro nós vamos precisar*
- *pode dar frutistos po futuro*
- *ir viver para outro país*
- *nos facilitará encontrar trabalho no estrangeiro no futuro*
- *as pessoas têm de emigrar*

b. getting a job (4). Ex.:

- *para eu encontrar um emprego melhor*
- *muitas empresas contratam com mais facilidade funcionários que sabem línguas estrangeiras*

c. use at work (5). Ex.:

- *para as nossas futuras profissões*
- *posso usa-las para a minha profissão*
- *no nosso trabalho*
- *se no futuro tiver um emprego que envolva ir ao estrangeiro*
- *se viajarmos para outro país por motivos de trabalho [ou lazer]*

d. studies (3). Ex.:

- *se quisermos ir para universidades estrangeiras, para trabalhos*
- *pode melhorar o acesso dos alunos no estrangeiro*
- *pode ser preciso ir estudar para o estrangeiro*

e. everyday use (3). Ex.:

- *hoje em dia todo esta ligado com línguas*
- *[…], para entendermos os rótulos das embalagens ou as instruções de alguma coisa*

f. one's general future (5). Ex.:

- *podem ser (e são) uma mais valia para o nosso futuro*

		• *provavelmente vai ser muito importante no nosso futuro* • *mais tarde vamos necessitar muito*				
	30	**35**	**T = 65**	**1**	**6**	**T = 7**
C) Self-concept-related	NO EVIDENCE	NO EVIDENCE	0	**a.** ease of communication (7). Ex.: • *a forma como o inglês se torna simples e nos permite contactar com pessoas mesmo que estas não souberem a nossa língua* • *de o ouvir e tentar entender ao máximo* • *saber falar a língua* • *poder comunicar em inglês*	• **a.** ease of communication (4). Ex.:*a maneira como falamos porque é uma língua bastante fluída* • *o facto de ser uma lingua facil de aprander* • *a forma de como eles simplificam a forma de dizer as coisas* • *a sonoridade da língua e a facilidade em a aprender* • *parte de poder falar inglês. :D* • *poder falar com alguma facilidade uma língua estrangeira* • *consigo escrever textos em Inglês*	**a. commun.** 11
	0	**0**	**T = 0**	**4**	**7**	**T = 11**
UNCLEAR	• *ajudar a ir para outros países* • *Inglês porque é uma língua muito usada no estrangeiro*	• *se alguma vez tiver que ir para o estrangeiro* • *podem me ajudar se for para o estrangeiro* • *ingles é a língua mais falada no mundo* • *cada vez mais saber falar outras línguas é muito importante*	(6)	• *traduzir para português* • *gosto de misturar um bocado o inglês com o português*	• *tudo* • *podermos ajudar, por exemplo, turistas. Em viagens e excursões percebemos o que diz o guia. E mesmo em estabelecimentos comerciais, fora do país, conseguimos indicar o que pretendemos melhor*	(4)
	60-2	**72-4**		**47-2**	**57-2**	

* mistakes have not been corrected

c. categories and coding of answers* to q11 and q12 in the questionnaire (content analysis)

A) sphere related to the learning (q12) and knowledge (q11) of Science, in terms of the understanding or learning of or getting acquainted with natural phenomena and objects, as well as formal school Science and its study/logics, which enhances one's knowledge;
B) additional instrinsic level whereby students envisage the value of learning Science in their daily and/or future lives, acknowledging its presence interrelated with other areas, applying and appraising knowledge, in general or the one specifically acquired;
C) dimension specifically connected with future professions and academic courses, in the area of Science.

CATEGORIES	Coded 7th grader answers (q12): importance of Science learning	Coded 8th grader answers (q12): importance of Science learning	**tot Imp SCI (q12)**	Coded 7th grader answers (q11): positive aspects of Science	Coded 8th grader answers (q11): positive aspects of Science	**tot Knw SCI (q11)**
A) Knowledge construction	**a.** understanding of the natural *milieu* (17). Ex.: • *fala sobre a Natureza* • *mostra-nos coisas sobre a terra* • *devemos saber mais sobre a Natureza e o que ela nos oferece* • *temos mais conhecimentos da Natureza e podemos nos ligar mais a ela* • *nos permite conhecer melhor o que nos rodeia* • *ficamos a saber mais sobre o planeta onde vivemos* • *assim conseguimos compreender melhor a terra, etc...* • *precisamos de saber como é o ambiente que nos rodeia e como ele está constituído* • *assim podemos no futuro saber mais sobre o meio ambiente e não só*	**a.** understanding of the natural *milieu* (25). Ex.: • *todoa podem saber o que mais gostam da natureza e saber explorar o ambiente* • *é bom conhecer o mundo em que vivemos de uma forma mais complexa* • *assim sabemos (quase) tudo o que se passa a nossa volta* • *podemos conhecer o nosso planeta melhor* • *para aprender-mos como são as coisas, o que constituem ,..* • *nos faz saber mais sobre a Natureza* • *permite-nos conhecer o Mundo* • *ajuda a perceber melhor a origem da vida e dos seres vivos* • *aprender no meio em que vivemos, o que nos rodeia e o que somos é muito importante* • *é bom saber como o nosso*	**a. underst.** 42 **b. develop.** 8	**a.** understanding of the natural *milieu* (5). Ex.: • *a explicação que nos dá sobre muitas das coisas que nos rodeiam* • *a exploração do mundo e ficar a saber como e constituído* • *aprender mais sobre o meio que nos rodeiam, o nosso planeta, [e por isso gosto de Ciências]* **c.** Science curriculum (13). Ex.: • *quando falamos dos vulcões* • *as plantas* • *as rochas* • *o seu estudo e das suas teóricas* • *placas tectonicas* • *fazer as esperiencias e ouvir a professora a falar* • *Continental Drift* • *a matéria das células,*	**a.** understanding of the natural *milieu* (15). Ex.: • *aprender sobre animais e as suas características* • *o facto de saber mais coisas, como é a vida, como funciona o nosso corpo, como funciona o mundo à nossa volta, a interação dos ecossistemas* • *a forma como nos ajuda a compreender a natureza e tudo o que nos rodeia* • *saber o porquê de algumas coisas acontecerem na natureza e a origem delas* • *saber como a Natureza é, e como nos somos dependentes dela* • *conhecer o que levou a extinção dos dinossauros como se criou a vida na terra etc.* • *de poder perceber como as coisas são feitas e porque é*	**a. underst.** 20 **c. school** 33

	• *ajuda-me a compreender o mundo que me rodeia* • *temos que saber de que são feitas as coisas naturais que nos rodeiam* • *ficamos a perceber tudo o que nos rodeia* • *ainda muita coisa a descobrir com o meio* **b.** broader/richer knowledge (4). Ex.: • *para a nossa cultura geral* • *sem ela não sabia tantas coisas como sei agora* • *pois estamos a enriquecer o nosso saber*	*mundo ``funciona´´* • *para sabermos mais sobre o nosso corpo em si e outras coisas* • *ela consegue fazer com que nós entendamos os acontecimentos que nos rodeiam* • *podemos aprender mais sobre o nosso corpo e sobre a natureza e o meio ambiente* • *antes de eu ter ciências não sabia nada sobre a natureza e o que lá podia encontrar* • *ajudanos a perceber a natureza e um pouco do mundo* • *para sabermos mais sobre o planeta onde vivemos e o nosso dia-a-dia* • *importante perceber e conhecer os conceitos da ciência pois ciência é vida* • *para termos as noção daquilo que nos rodeia e da Natureza á nossa volta, e para percebermos também como o nosso corpo e o nosso psicológico funcionam* • *serve para interpretar melhor a vida* **b.** broader/richer knowledge (4). Ex.: • *ficamos mais cultos e conseguimos comprovar muitas coisas com a ciência* • *melhora o nosso conhecimento* • *estou a alargar a minha área do saber*		*bactérias e do Ser Humano* • *as aulas praticas* • *a matéria escolar* • *conhecer mais sobre o estudo da Terra e fazer experiências na aula pois vejo coisas que não fazia ideia que aquilo acontecia*	*que são assim* • *o conhecimento do Mundo e do funcionamento dos seres vivos!* • *explorar o meio ambiente, conhecer como foi criada/feita a Terra, quais são os constituintes da terra, água,..* • *aprender sobre os biomas e as cadeias alimentares* **c.** Science curriculum (20). Ex.: • *a Ciências gosto de tudo* • *o que aprendemos* • *Aulas de Ciências* • *das experiências* • *o corpo humano* • *os Planetas* • *fazer esperiências e ver ao microscópio* • *Biologia, Geologia, ...* • *a parte experimental e a observação de fenómenos naturais que acontecem por todo o mundo muitas vezes* • *as suas experiências, a sua lógica e resumindo, gosto do que é a Ciência*	
	21	**29**	**T = 50**	**18**	**35**	**T = 53**

B) Knowledge applicability	**a.** Science's holistic presence (3). Ex.: • *em todas as disciplinas tem uma parte de Ciência logo vai ser preciso saber um pouco* • *independentemente do que nos quisermos seguir a regras e coisas básicos que se aprende nesta disciplina para o nosso dia-a-dia* • *as ciências estão em todo o lado e temos que as perceber* **b.** everyday use (2). Ex.: • *e uma disciplina que nos usamos no nosso dia-a-dia* • *ela estará sempre presente no nosso dia-a-dia e na nossa vida* **c.** one's general future (6) • *um dia iremos precisar de saber a formação dos continentes e os fenómenos da Natureza* • *no nosso futuro poderemos vir a precisar das matérias que damos agora* • *quando formos maiores podemos precisar delas* • *no futuro é nos muito favorável*	**a.** Science's holistic presence (2). Ex.: • *hoje em dia, em todo o lado há ciência* • *ciencias fala de varias materias diferentes e ajuda em tudo* **b.** everyday use (5). Ex.: • *nos informaçõe muito úteis para o nosso dia a dia* • *ajuda-nos no dia a dia* • *é dos trabalhos que mais ajuda a comunidade em termos de novas descobertas* • *posso aplicar os conhecimentos adquiridos em diversas situações do dia-a-dia e um dia mais tarde a nível profissional* • *no dia a dia pode ajudar-nos a resolver várias situações* **c.** one's general future (8) • *pode ser preciso para alguma ocasião* • *eu posso um dia vir a precisar da matéria que eu dei na escola* • *nos vai ajudar no nosso futuro para o que nos queremos fazer* • *com as ciencias consigo adquirir conhecimentos que um dia precisarei na minha vida* • *para mim acho que a disciplina de Ciências é uma das mais importantes para o Futuro* • *se um dia precisarmos de descrever alguma planta ou identificar algum animal em Ciências damos isso* • *para teres conhecimento e perceberes se alguém*	**a. presence** 5 **b. day** 7 **c. future** 14	**a.** Science's holistic presence (5). Ex.: • *o facto de em praticamente todas as disciplinas tem uma parte de Ciências* • *tudo a nossa volta tem um pouco de ciências, para descobrir e para saber* • *a forma como se relaciona com a matemática e com todas as outras disciplinas* • *o facto de que podemos passar em qualquer lugar, observando plantas, rochas... e é tudo ciências* • *ver a vida e a natureza que dependam da ciencia que e a vida* **d.** specific use (9). Ex.: • *conseguir reconhecer o que aprendi em coisas que não dava importância mas que agora já dou devido ao que aprendi* • *poder saber destingir uma rocha ou um mineral, e aprender a suas características* • *poder encontrar rochas (ou outros elementos) e identifica-los com linguagem científica* • *poder observar a natureza e conseguir identificalas* • *saber identificar o nome das várias rochas com que me defronto e ficar mais culta* • *o facto de quando estou doente, saber o que devo fazer, como devo reagir, o que me levou a ficar assim* • *estar sempre a aprender*	**a.** Science's holistic presence (2). Ex.: • *tudo, gosto de todas as tranformações, reações,... ~~pois aparecem no nosso dia a dia~~* • *com tudo o que me rodeia, por ex: os animais, a natureza e até a nossa alimentação* **d.** specific use (5). Ex.: • *saber o nome de um animal* • *podermos aplicar os conhecimentos das ciências no nosso dia-a-dia e ficarmos uma pessoa mais culta e informada* • *que quando estou a andar na rua consigo identificar os animais ou plantas que vejo e consigo identificar vários fenómenos naturais* • *quando ouço falar de certas partes do corpo humano eu já tenho conhecimentos básicos sobre o que estou a ouvir* • *ver que o que aprendemos nas aulas de facto se aplica ao dia-a-dia*	**a. presence** 7 **d. specific** 14

		relacionado às Ciências te falar sobre isso no futuro		*coisas que não sabia existirem e ficar com mais culto geral*		
	11	**15**	**T = 26**	**14**	**7**	**T = 21**
C) Professional and/or academic dimension	**a.** working with Science (6). Ex.: • *como crianças não usamos esse conhecimento muitas vezes mas no futuro, até no nosso emprego, por exemplo, pode ser exigido* • *se quisermos ser geologistas, cientistas,etc. TEMOS QUE APRENDER CIENCIAS e isso toda a gente sabe* • *se um dia quisermos ser cientistas já temos conhecimentos suficientes para isso* • *um dia mais tarde a profissao que escolher pode ter de conter as ciências* **b.** Science studies (3). Ex.: • *só seria util se escolhece-mos algum curso em que ciências era necessário* • *neste momento não sei o que quero ser quando for grande e ciências pode estar incluído no curso* • *o curso de ciências é o mais difícil ou seja também é o melhor ou seja quando precisarmos de um emprego e termos no nosso currículo que estivemos na universidade de ciências vão deduzir que somos bastantes espertos*	**a.** working with Science (6). Ex.: • *quando for adulta gostaria que a minha profissão fosse ligada com as Ciências (investigadora, médica...)* • *mo futuro a nossa profissão pode ter qualquer coisa a ver com isso* • *eu tenciono ser médico quando crescer* • *pois quero ser cientista* • *para o nosso futuro, possivelmente para o nosso imprego...* • *é importante para o nosso futuro. Se nos quisermos ser Médicos ou Engenheiros necessitamos de Biologia ou Ciencias. Por isso, ...* **b.** Science studies (4). Ex.: • *é uma disciplina importante para diversos cursos universitários* • *se quisermos seguir um curso, temos de saber um pouco de tudo e acho que em todos os cursos as Ciências são importantes*	**a. job** 12 **b. study** 7	NO EVIDENCE	NO EVIDENCE	0
	9	**10**	**T = 19**	**0**	**0**	**T = 0**

IDIOSYNCRATIC	• *eu gosto* • *acho muito interessante essa disciplina* • *as experiências sejam divertidas e não sejam secantes*	• *saber o que é bom para ele*	(4)	• *não é nada* • *as notícias* • *tudo o que me rodeia* • *é da tecnologia avançada* • *...mostrar aos outros que sei uma determinada matéria* • *ver documentários, ver canais que falam de ciência como por exemplo o "National Geographic"*	• *quando vou ao cinema eu gosto de ver filmes em ingles mas cientificos como por exemplo, O Parque Jurassico e muitos outros filmes que ja vi no cinema. Mas tambem na literatura quando leio um livro eu acho mais interessante ler livros científicos* • *o facto de aprender coisas novas que me era desconhecido* • *como existe varias coisas interessantes no mundo* • *observar a mãe Natureza* • *observar os animais* • *tudo*	(12)
	44-3	**55-1**		**38-6**	**48-6**	

* mistakes have not been corrected

d. categories and coding of answers* to q14 and q15 in the questionnaire (content analysis)

A) resources and strategies to systematise, organise, synthetise, communicate and teach the non-language and language subject topics;
B1) activities and strategies typical of the Science classes in addition to the theoretical setting: practical activities, in labs or class, and learning opportunities also outside the school (outdoor experiences, study visits, etc.);
B2) diversification of activities to promote the linguistic learner's understanding and/or participation through the development of language competences;
C) characteristics to assume while teaching, such as: clarity, interaction, slowness, etc.;
D) possible presence of two languages (English along with Portuguese) through the EP project or during any English class.

CATEGORIES	Coded 7th grader answers (q14): advice for Sci-new	Coded 8th grader answers (q14): advice for Sci-old	**tot Sug SCI (q14)**	Coded 7th grader answers (q15): advice for Eng-old	Coded 8th grader answers (q15): advice for Eng-old	**tot Sug EN (q15)**
A) Subject representation and communication	**a.** audiovisuals (1). Ex.: • *Visualização de filmes […]* **b.** outlines (5). Ex.: • *[…] anotação de esquemas* • *Com esquemas e tabelas* • *Fazer-nos passar mais esquemas* • *fazer sempre um resumo da matéria dada na aula, pois os nossos cadernos estão um pouco confusos […]* **c.** presentations (3). Ex.: • *Gostaria de visualizar mais PowerPoint […]* • *Passar mais powerpoints a explicar a matéria porque no meu caso para mim a aprendizagem assim é mais fácil* **d.** worksheets (4). Ex.: • *Fazermos exercícios depois da matéria dada*	**a.** audiovisuals (3). Ex.: • *Mais filmes e vídeos […]* • *[…] mais recursos audiovisuais* **b.** outlines (0) **c.** presentations (2). Ex.: • *Mostrar mais power points* **d.** worksheets (2) • *Fazer um pouco de mais exercicios do livro e do caderno de atividades* • *Fazer mais fichas de trabalho*	**a. audiovis.** 4 **b. outlines** 5 **c. present.** 5 **d. worksheets** 6	**a.** audiovisuals (2). Ex.: • *Ver filmes em Inglês com legendas pois isso vai nos ajudar a associar melhor* **b.** outlines (1). Ex.: • *Esquemas* **c.** presentations (0) **d.** worksheets (2). Ex.: • *Dar talvez mais fichas*	**a.** audiovisuals (4). Ex.: • *Ver mais filmes e vídeo […]* • *Mostrar mais animações* • *[…] visionamento de filmes em inglês sem legendas.* **b.** outlines (1). Ex.: • *Mais esquemas de palavras com regras de fala* **c.** presentations (2). Ex.: • *Ver mais power points* **d.** worksheets (6). Ex.: • *Fazer mais exercícios de gramática* • *Resolução de fichas de revisões* • *Fazer mais fichas para consolidar os nossos conhecimentos* • *Fazer mais fichas de trabalho de outros livros para além do manual escolar*	**a. audiovis.** 6 **b. outlines** 2 **c. present.** 2 **d. worksheets** 8

	• *podia dar mais fichas informativas* **13**	**7**	**T = 20**	**5**	**13**	**T = 18**
B1) Science – practical and field work	**a.** practical work (6). Ex.: • *Ter aulas mais práticas* • *[…] devíamos fazer várias atividades práticas pois é mais fácil aprender porque estamos a ver o que acontece e percebemos melhor* • *acho que a única coisa que eu gostaria de desenvolver mais, é realizar mais experiências* • *[…] que podiamos fazer mais experiências para a compreensão de algumas materias que damos* **a.** field work (5). Ex.: • *interagir mais com a natureza* • *fazermos visitas de estudo de acordo com a matéria que estamos a dar* • *Haver mais saídas de campo* • *[…] sugeria á Professora que fosse connosco fazer mais visitas de estudo para identificar, caraterizar as rochas, […]. Esta sugestão não é só para este tema como todos os outros.*	**a.** practical work (19). Ex.: • *acho que devíamos fazer mais experiências praticas.* • *Eu sugiro mais aulas práticas em vez de teóricas* • *Na minha opinião as aulas de ciências podiam ser mais práticas utilizando mais recursos manuais* • *Acho que a professora podia-nos dar mais aulas práticas nas aulas de 45 minutos, o que faz com que fiquemos mais interessados* • *Mais aulas práticas [e visitas ao exterior,] basicamente mais a parte experimental da matéria* • *Fazer mais experiencias* • *para ciencias a professora podia fazer mais trabalhos experimentais* • *[aulas] experimentais para podermos aplicar os nossos conhecimentos* • *Aplicar os conhecimentos em situações práticas (experiências)* **b.** field work (5). Ex.: • *[…] visitas ao exterior […]* • *[…] irmos para o meio ambiente...* • *[…] começar a fazer experiências ao ar livre* • *[…] sobretudo, mais Visitas de Estudo*	**a. practical** 25 **b. field** 10	NO EVIDENCE	NO EVIDENCE	0

		• *Acho que devíamos fazer mais saídas de campo para perceber a matéria na prática ajudando a aprender a parte teórica*				
	11	**24**	**T = 35**	**0**	**0**	**T = 0**
B2) English – activities promoting Language skills	NO EVIDENCE	NO EVIDENCE	0	**a.** listening (2). Ex.: • *gostaria de realizar mais trabalhos audio pois e oque eu tenho mais dificuldades* **b.** reading (1). Ex.: • *Leitura de mais livros em inglês* **c.** speaking (3). Ex.: • *Falar em dialogo* • *Fazermos um debate sobre qualquer coisa em Inglês, em que todos os alunos deveriam de participar*	**a.** listening (1). Ex.: • *[ver filmes,] ouvir musica e interpretar as letras* **b.** reading (0) **c.** speaking (2). Ex.: • *Na aula todos deviam de falar inglês*	**a. listen** 3 **b. read** 1 **c. speak** 5
	0	**0**	**T = 0**	**6**	**3**	**T = 9**
C) Posture in class	**a.** clarity (2). Ex.: • *explicar com mais calma* • *ser mais calma nas suas explicaçoe porque há alguns conceitos que nao sao muito abordados nas aula e a professora dá como dado* **b.** dynamicity (4). Ex.: • *Falar com mais expressividade* • *Dar a matéria de uma forma mais divertida* • *[…] para a minha melhor aprendizagem, as aulas devem ser interactivas e divertidas*	**a.** clarity (7). Ex.: • *mostrar menos power poits e explicar melhor* • *Explicar melhor os termos científicos mais difíceis* • *A professora devia explicar melhor a matéria lecionada* • *Falar mais devagar* **b.** dynamicity (4). Ex.: • *[…] mais atividades […]* • *Mais aulas interativas […]* • *Usarmos mais jogos e atividades* • *Por se no nosso lugar durante a aula e ser-lhe feitas também algumas questões mas nada em*	**a. clarity** 9 **b. dynam.** 8	**a.** clarity (3). Ex.: • *Tentar explicitar melhor as coisas* • *A maioria das vezes explica bem e faz com que aprendamos a gostar de Inglês mas à outras vezes que nem tanto.* • *avançar mais devagar na matéria para que os alunos aprendam melhor* **b.** dynamicity (2). Ex.: • *[…] para a minha melhor aprendizagem, as aulas devem ser interactivas e divertidas* • *[…] apenas que as aulas*	**a.** clarity (5). Ex.: • *Explicar com clareza os assuntos explicados na aula* • *[…] falar um bocado mais devagar (Inglês) nas aulas (de Inglês)* • *Sugiro que fale mais devagar.* • *Falar mais devagar* **b.** dynamicity (0)	**a. clarity** 8 **b. dynam.** 2

	• *Penso que as professoras deviam dar mais motivação aos alunos*	*termos profissionais*		*fossem um pouco mais divertidas*		
	6	**11**	**T = 17**	**5**	**5**	**T = 10**
D) Management of the language(s) used in class	**a.** contact with people (0) **b.** language turns (4). Ex.: • *Depois de dizer em ingles explicar melhor em portugues* • *Acho que deveria explicar em Inglês e Ciências em termos científicos e depois em termos normais para relacionarmos ambos e ser mais fácil a aprendizagem* • *[…] pois os nossos cadernos estão um pouco confusos, uma aula Inglês depois outra Português e então a matéria ainda um bocado espalhada por todo o caderno […]*	**a.** contact with people (1). Ex.: • *Mais socialização com pessoas estrangeiras que só saibam falar Inglês* **b.** language turns (0)	**a. contact** 1 **b. turns** 4	**a.** contact with people (1). Ex.: • *Interagir com Ingleses ou Americanos para que possamos melhorar na comunicação* **b.** language turns (4). Ex.: • *[…] não falar inglês mas tambem falar um bocado mais de português* • *Para aprendermos melhor Inglês sugeria á Professora que falasse em Inglês e depois traduzisse para Português […]* • *Depois de dizer em ingles explicar melhor em portugues*	**a.** contact with people (2). Ex.: • *[…] Mais contato com o mundo estrangeiro […]* **b.** language turns (1). Ex.: • *Especificar o que é que algumas palavras significam*	**a. contact** 3 **b. turns** 5
	4	**1**	**T = 5**	**5**	**3**	**T = 8**
Other suggestions	Easier tests; tests with more English; more homework; better pronunciation; new teaching method; etc. **7 (6+1)**			Study visits; more homework; less homework; more tests on English; practical activities; etc. **8 (4+4)**		
Liked all	**5**	**7**	T = 12	**9**	**9**	T = 18
Not provided any	**4**	**9**	T = 13	**11**	**20**	T = 31
	49	**60**		**45**	**57**	

* mistakes have not been corrected

e. categories and coding of answers* to q18.1 and q20 in the questionnaire (content analysis)

A) both Science (general knowledge is not included here) and English/Language are mentioned as a sum or mix of "learning aspects" and in other combinations whereby Science and English are explicit, such as the case of the scientific lexicon in this foreign language;
B) this English/Language field is represented by progress of language skills (speaking, writing, pronunciation) and vocabulary (explicitly or implicitly associated to the English language) or by the relevance of this language;
C) improved and broadened knowledge and learning experience, relevant per se and for a future vaguely described;
D) dimension having concrete implications for the future (as the main aspect referred to in the answer) in terms of opportunities for studying and working.

CATEGORIES	Coded 7th grader answers (q18.1): EP important for …	Coded 8th grader answers (q18.1): EP important for …	**tot Imp EP (q18.1)**	Coded 7th grader answers (q20): advantages of EP	Coded 8th grader answers (q20): advantages of EP	**tot Adv EP (q20)**
A) Composite learning	**a.** learning Science with English (3). Ex.: • *assim conciliamos duas disciplinas e conseguimos torná-la numa só, o que ajuda na nossa aprendizagem* • *porque estamos a aprender ao mesmo tempo duas coisas a matéria de ciências e inglês* • *e bom consiliar estas duas disciplinas que sao tao importantes para os alunos* **b.** learning Science in English (3). Ex.: • *porque aprendemos novos conceitos em outra língua logo esse é importante para a nossa aprendizagem* • *porque também e bom aprendermos ciências em ingles* • *o facto de ter as aulas de*	**a.** learning Science with English (1). Ex.: • *porque permite-nos melhorar o nosso inglês enquanto aprendemos ciências* **b.** learning Science in English (7). Ex.: • *pois aprendemos varias materias em linguas diferentes* • *o projeto dá-nos a possibilidade de aprender as teorias do Mundo na língua universal* • *pois podemos aprender os mesmos conteudos de ciências em português e em inglês que nos pode ajudar no nosso dia a dia* • *porque em vez de só aprendermos Ciências numa língua, aprendemos as Ciências em Inglês uma*	**a. with** 4 **b. in** 10 **c. learning** 4 **d. vocab.** 3	**a.** learning Science with English (1). Ex.: • *melhoramento do ingles e melhoramento das duas em simultâneo* **b.** learning Science in English (1). Ex.: • *saber coisas de Ciências em Inglês* **c.** greater learning of both (3). Ex.: • *ajudas na compreensão da matéria em inglês e ciências(espaço para tirar dúvidas)* • *termos um conhecimento maior a cerca das duas disciplinas* • *várias vantagens, como aprefeiçoar o Inglês e a Ciências* **d.** increased vocabulary of both (0)	**a.** learning Science with English (1). Ex.: • *de enriquecer as nossas aprendizagens não só ao nível das Ciências e do Inglês como também ao nível de outras disciplinas que fazem interdisciplinariedades com o Projeto* **b.** learning Science in English (2). Ex.: • *que praticamos mais ingles temos a vantagem de ciencias em ingles e é maravilhoso* • *adquirir novos conhecimentos de ciências em inglês e melhorar as nossas bases em inglês* **c.** greater learning of both (0) **d.** increased vocabulary of both (2). Ex.:	**a. with** 2 **b. in** 3 **c. learning** 3 **d. vocab.** 2

	ciências dadas numa língua que não a materna e enriquecemos o nosso vocabulário **c.** greater learning of both (2). Ex.: • *para nos obrigar a estudar e melhorarmos tanto o inglês como ciências* • *<u>aprendemos mais coisas sobre Inglês e sobre Ciências.</u> E aprendemos novas palavras sobre Ciências em Inglês* **d.** increased vocabulary of both (1). Ex.: • *porque assim se poderá ter um vocabulário mais avançado a inglês e a ciências* **e.** improved SCI learning and EN vocabulary (0) **f.** improved SCI vocabulary and EN proficiency (1). Ex.: • *porque nos ajuda a desenvolver a língua inglesa e enriquece o nosso vocabulário na área das Ciências* **g.** scientific EN mastery (5). Ex.: • *para melhorarmos a lingua inglesa em termos científicos* • *hoje em dia usamos muitas designações científicas em inglês* • *pois ciências em inglês tem muito vocabulário e isso vai nos ajudar bastante*	*língua muito importante para o futuro* • *porque podemos aprender muitas coisas de Ciências em Inglês. O que me dará muito jeito* **c.** greater learning of both (2). Ex.: • *ajuda-nos a consolidar o conhecimentos em inglês e em ciências* • *porque é uma coisa que nos motiva a ficar melhor tanto a ciencias quanto a ingles* **d.** increased vocabulary of both (2). Ex.: • *porque aprendemos um maior vocabulário quer no ingles quer nas ciências* • *porque aprendemos muita coisa e aumentamos o nosso vocabulário tanto em Inglês como em Ciências* **e.** improved SCI learning and EN vocabulary (1). Ex.: • *porque o Projeto "English Plus" em Ciências dá-nos conhecimentos para a vida de nomes em inglês relacionados com a vida e a biodiversidade* **f.** improved SCI vocabulary and EN proficiency (0) **g.** scientific EN mastery (3). Ex.: • *muitas vezes na nossa vida vamos ter de lidar com muito vocabulário em Inglês,*	**e. ..+..** 1 **f. ..+..** 1 **g. specif.** 8	**e.** improved SCI learning and EN vocabulary (0) **f.** improved SCI vocabulary and EN proficiency (0) **g.** scientific EN mastery (0)	• *aumentar o nosso vocabulário quer em inglês, quer em ciências e pode ajudar no nosso futuro* • *aumentar o vocabulário Inglês (só de Inglês) e aumentar também o vocabulário de Ciências em Inglês* **e.** improved SCI learning and EN vocabulary (1). Ex.: • *ajuda-me no vocabulário em Inglês e no conhecimento da Ciência* **f.** improved SCI vocabulary and EN proficiency (0) **g.** scientific EN mastery (1). Ex.: • *conhecer melhor palavras ao nível científico em inglês. Mais facilidade na língua inglesa*	**e. ..+..** 1 **f. ..+..** 0 **g. specif.** 1

	• *aprendemos mais coisas sobre Inglês e sobre Ciências. <u>E aprendemos novas palavras sobre Ciências em Inglês</u>*	*e se tivermos a noção do vocabulário científico em Inglês é muito fácil para nós* • *porque nos ajuda a entender termos de ciencias em inglês*				
	15	**16**	**T = 31**	**5**	**7**	**T = 12**
B) English sphere	**a.** vocabulary increase (2). Ex.: • *porque ficamos com muito mais vocabulário do que os outros alunos que andam no ensino normal* • *porque actualizo o meu vocabulario em ingles* **b.** language improvement (6). Ex.: • *[…] quando formos maiores teremos um grande progresso na língua inglesa. Com este projeto também conseguimos tirar mais dúvidas e aprender muito mais* • *tendo o progeto de english plus lidamos mais com o Ingles no nosso dia-a—dia* • *porque é um projeto em que se pode aprender mais Inglês a falar melhor e a escrever melhor* • *porque ajuda-nos a enteder melhor a língua* • *com o protejo estou à frente um bocado porque aprendo sempre mais palavras e regras* **c.** importance of this language (1). Ex.: • *o Inglês é a língua mais importante de todas por isso asso muito bem*	**a.** vocabulary increase (2). Ex.: • *porque nos da mais vocabulário* • *aumentamos o nosso vocabulário e aprendemos mais* **b.** language improvement (5). Ex.: • *porque aprendemos vário vocabulário a falar melhor e aprendemos mais do que o habitual e é bastante fixe* • *porque nos dá a possibilidade de apreender a língua inglesa, pratica-la, e também temos contacto com pessoas que falem a língua* • *porque da nos a oportunidade de aprender duas línguas e expandir o nosso vocabulário* • *é um projeto que apoia todos os alunos a melhorar o seu inglês aprendendo mais para o seu futuro* **c.** importance of this language (2). Ex.: • *acho que devemos ter contacto com o ingês em todos os aspetos, […]* • *porque cada vez mais e preciso o ingles e é uma mais valia para nos*	**a. vocab.** 4 **b. language** 11 **c. import.** 3	**a.** vocabulary increase (1). Ex.: • *aprender mais vocabulário de inglês* **b.** language improvement (12). Ex.: • *para podermos falar* • *aprefeiçoar a lingua Inglesa e adquirir mais conhecimentos* • *diversas como por exemplo melhorar bastante o nosso inglês* • *enriquece o nosso conhecimento na língua inglesa* • *de aprendermos mais rápido e Inglês, e aprender novas palavras que se não estivéssemos nesta turma não aprenderiam* • *para aprendermos melhor a dominar a língua inglesa* • *uma melhor aprendizagem de Inglês* • *de contribuir para a nossa fala e pronuncia em Inglês* • *saber melhor pronunciar o inglês em situações no futuro* **c.** importance of this language (0)	**a.** vocabulary increase (6). Ex.: • *expandir o vocabulário* • *aumenta-nos o vocabulário* • *podemos aprender mais vocabulário em Inglês* • *aumentamos o nosso vocabulário e aprendemos mais* **b.** language improvement (15). Ex.: • *falar melhor ingles e ter mais conhecimentos* • *melhorar as capacidades em inglês* • *nos ajudar a comunicar em inglês* • *mais familiaridade com a língua inlesa* • *podera ser melhor para podermos desenvolver o nosso ingles* • *muitas vantagens uma delas, sermos mais fluentes na lingua* • *consigo falar melhor ingles, saber algumas palavras desconhecidas entre outras* • *mais prática na fala de ingles* • *ajuda-nos muito a praticar o nosso Inglês e a sabermos mais vocabulário, também nos ajuda melhor a entender melhor os estrangeiros* • *o nosso futuro e a melhoria*	**a. vocab.** 7 **b. language** 27

					• *da aprendizagem a inglês* • *podermos ter mais conhecimento sobre o inglês em diferentes areas de aprendizagem* **c.** importance of this language (0)	
	9	**9**	**T = 18**	**13**	**21**	**T = 34**
C) Lifelong learning	**a.** broader/richer knowledge (6). Ex.: • *apura os conhecimentos* • *gosto muito e aprendo muito* • *porque e bom para o conhecimento* • *logo a aprendizagem vai ser melhor e iremos adquirir mais conhecimentos* • *porque assim ficamos com maiores orisontes* **b.** one's general future (3). Ex.: • *pois acho que se revelará muito importante para a nossa vida* • *acho que este projeto é muito enriquecedor para nós, pois nos ajudará muito para o futuro*	**a.** broader/richer knowledge (6). Ex.: • *porque é sempre bom expandir os nossos "horizontes" na educação e no descobrimento de novos métodos de aprendizagem* • *porque aprendemos novas coisas* • *é bom ficarmos a saber mais coisas* • *acho que é uma boa experiência que enriquece o nosso saber* • *acho que ao participar neste projeto estou a ter uma educação mais complexa em relação a alunos que não participam* **b.** one's general future (3). Ex.: • *é importante para o nosso futuro* • *porque contribui muito para o nosso futuro*	**a. knowl.** 12 **b. future** 6	**a.** broader/richer knowledge (7). Ex.: • *o melhor desenvolvimento* • *melhor aprendizagem e compreensão* • *de aprendermos um pouco mais daquilo esperado* • *termos mais conhecimentos que outros alunos não podem ter* • *poderá ter muitas vantagens mesmo que seja mais difícil que as aulas normais mas penso que contribui muito para nos enquanto crianças* **b.** one's general future (3). Ex.: • *mais saídas no futuro* • *podemos aprender para um futuro melhor* • *nós os alunos sairemos melhor formados da escola mais preparados para o que vier*	**a.** broader/richer knowledge (9). Ex.: • *o conhecimento que adquirimos* • *de aprender mais coisas do que o normal* • *melhorar os nossos conhecimentos* • *enriquecer o nosso saber* • *por exemplo: viagens no final do 9º ano a Inglaterra; visitas de estudo a navios militares ingleses, trabalhos interativos com o ingles e as ciencias; peças de teatro,...* • *temos experiências que outras turmas não têm* • *complementar o meu currículo um dia* **b.** one's general future (2). Ex.: • *ajuda na aprendizagem e preparação para os seguintes anos* • *mais opurtunidades para cursos e futuro*	**a. knowl.** 16 **b. future** 5
	9	**9**	**T = 18**	**10**	**11**	**T = 21**
D) Professional/ Academic future	**a.** getting a job (0) **b.** studying/working abroad (1). Ex.: • *se quisermos ir para uma*	**a.** getting a job (3). Ex.: • *porque juntando o saber em Ciências e o saber em Inglês temos mais probabilidades de ter emprego na área que*	**a. job** 3	**a.** getting a job (4). Ex.: • *muitas, como por exemplo a saídas no mercado de emprego* • *no futuro podemos ser*	**a.** getting a job (5). Ex.: • *contribui para o nosso futuro profissional* • *melhores chances de conseguir um trabalho no*	**a. job** 9

	universidade em que só se fala Inglês compreendemos as pessoas melhor **c.** Science studies (2). Ex.: • *porque se continuarmos em ciências e seguirmos isso no futuro iremos se calhar para outros países e teremos de falar inglês* • *porque podemos ir estudar para outro país e podemos precisar das ciências em inglês*	*queremos* • *para o nosso futuro tanto o inglês como as ciências são importantes e aprende-los juntos e fazer as actividades que fazemos da-nos muita bagagem profissional e escolar.* **b.** studying/working abroad (3). Ex.: • *porque se mais tarde formos trabalhar ou estudar para outro país nós temos muitos termos e conceitos em Inglês* • *porque se eu for para médico no estrangeiro eu preciso de saber,por exemplo, o nome de orgãos ou ossos* • *o inglês é a língua universal e é muito importante para nós aprender os termos científicos em inglês, pois ajuda-nos na nossa eventual profissão do futuro, já que a maior parte das profissões estão relacionadas com as ciências. Caso um dia tenhamos de ir trabalhar para o estrangeiro, saber ciências em inglês é uma mais valia* **c.** Science studies (3). Ex.: • *se quisermos estudar fora nesta área é importante* • *porque se um dia mais tarde quisermos seguir ciências já temos alguns conhecimentos em inglês* • *para o nosso futuro porque melhoramos o nosso inglês e*	**b. abroad** 4 **c. study** 5	*escolhidos para um trabalho por saber falar Inglês* • *se fosse para algum trabalho relacionado com ciências em inglês* **b.** studying/working abroad (0) **c.** Science studies (1). Ex.: • *talvez entrar numa boa universidade*	*estrangeiro no futuro* • *trará vantagens no futuro nas propostas quer de trabalho quer no currículo* • *se andarmos neste projeto quando formos a alguma entrevista de trabalho este projeto vai contribuir muito para a nossa contratação* **b.** studying/working abroad (2). Ex.: • *por exemplo, se alguém emigrar, tem muita mais 'bagagem', e o projeto ajuda-nos a ter muito mais vocabulário no inglês* • *se alguma vez for para algum país em que a língua seja o inglês irá ser mais fácil comunicar* **c.** Science studies (0)	**b. abroad** 2 **c. study** 1

		as ciências. Eu, por exemplo, quero seguir o curso de ciências no 10º ano, logo o projeto será muito benéfico para nós				
	3	**9**	**T = 12**	**5**	**7**	**T = 12**
Idiosyncratic	• *porque temos mais objectivos para alcançar* • *pois ajuda-nos a compreender melhor a matéria que demos em ciências*	• *é útil na nossa vida, por exemplo quando viajamos para o estrangeiro podemos ser questionados sobre algo que tem haver com ciências* • *porque nos da mais conhecimentos, do vocabulario cientifico*	(4)	• *nenhuma* • *é divertido* • *as vantagens que poderá ter é ajudar os alunos a superar as suas espectativas nas suas notas*	• mark improvement (2) • *bolsas de estudo* • *eu percebo melhor a matéria em inglês* • *um dia se eu for professor de ciências posso dizer em inglês o que aprendi quando era mais novo*	(8)
Not considered important	• *porque acho que não vai ser muito util no futuro* • *não utilizaremos muito ou raramente utilizaremos o Inglês em ciências no dia-a-dia*	• *nem é muito importante nem pouco* • *porque pode vir a ser util mas em algumas situações não* • *em CN não se justifica aprender em inglês* • *porque só num caso especifico vamos precisar de aprender a matéria de ciências* • *como aprendemos ciencias em portugues obrigatoriamente e nao faz cabeça grande aprender ciencias em ingles*	(7)	NO EVIDENCE	NO EVIDENCE	0
Unclear	• *porque ajuda-nós a desenvolver* • *o projeto "English Plus" em Ciências é muito importante* • *porque se damos Ciências em Inglês devemos estar bem preparados para isso*	• *porque estou aprender Inglês em Ciências* • *porque se aprendemos de uma maneira podemos aprender também por ser interessante*	(6)	• *muitas* • *muitas vantagens importantes*	• *poderia ter mais visitas de campo*	(3)
Not given	**1**	**0**	(1)	**6**	**0**	(6)
	43-(2+2+3)=36	**52-(2+5+1)=44**		**38-(3+2)=33**	**52-(4+1)=47**	

* mistakes have not been corrected

f. categories and coding of answers* to q21 in the questionnaire (content analysis)

A) conditions of the project such as language understanding or teacher posture;
B) consequences of the project in terms of student dedication and assessment.

CATEGORIES	Coded 7th grader answers (q21): difficulties of EP	Coded 8th grader answers (q21): difficulties of EP	Tot Dif EP (q21)
A) Conditions	**a.** language obstacle (2). Ex.: • *o facto de que deviam explicar em Inglês e em seguida em Português. Raramente o fazem* • *a nossa compreensão vai ser mais lenta, vamos ter mais dificuldades [e neste primeiro ano as notas vão ser mais baixas]* **b.** difficult classes/setting (0) **c.** teacher expectations (0)	**a.** language obstacle (6). Ex.: • *nós não entendermos bem algumas palavras inglesas* • *confundir algumas palavras portuguesas com inglesas* • *muito mais complexo que Ciências apenas em português* • *se não entendermos bem inglês não percebemos a matéria dada em ciências* • *temos que [estudar muito mais para Ciências e] saber muito bem o vocabulário em Inglês na disciplina de Ciências* • *penso que não pode ter dsvantagens apenas se não compreender-mos o contéudo de ciências em inglês* **b.** difficult classes/setting (4). Ex.: • *os testes serem um pouco mais difíceis* • *algumas dificuldades que não existem em outras turmas* • *por vezes o Projeto pode ser confuso* • *turmas grandes e um bocado cansativo e confuso* **c.** teacher expectations (2). Ex.: • *sermos desbeneficiados só porque as professoras acham que só por estarmos no english plus que temos que saber tudo e não podemos errar* • *outros professores sem serem os de ingles e de ciencias pensam que so por nos estarmos no projeto têm de exigir mais de nos*	**a. language** 6 **b. classes/setting** 4 **c. expectations** 2
	2	12	**T = 14**

B) Consequences	**a.** higher dedication (6). Ex.: • *nao sei, talvez tpcs a mais* • *retida muito do tempo dos alunos para descansar* • *é o aumento de materia que temos de decorar* • *nenhuma. Acho que nos devemos aplicar um pouco mais* **b.** mark decrease (5). Ex.: • *a nossa nota a ciências pode baixar* • *para os alunos que não se esforçam, baixem as notas* • *exige mais de nós como consequência as notas baixaram um bocado* • *[a nossa compreensão vai ser mais lenta, vamos ter mais dificuldades e] neste primeiro ano as notas vão ser mais baixas* • *no ínicio talvez um pouco difícil, […] mas eu acho no 2º Período posso retomar as notas como nos outros anos atrás*	**a.** higher dedication (7). Ex.: • *mais exigência* • *desperdiçar algum tempo livre* • *provoca mais estudo e dedicação* • *è um projeto muito exigente e trabalhoso* • *os testes, sendo numa língua diferente, preocupam-nos mais a estudar e esquecemos um pouco as outras disciplinas* • *temos que estudar muito mais para Ciências [e saber muito bem o vocabulário em Inglês na disciplina de Ciências]* • *necessitar de bastante tempo de estudo, o que pode levar a ter menos tempo para outras disciplinas* **b.** mark decrease (2). Ex.: • *baixar algumas notas no caso de pouco empenho* • *descida de notas em Ciências devido aos testes de Ciências terem uma parte em Inglês*	**a. effort** 13 **b. marks** 7
	11	9	**T = 20**
NOT DIFFICULT	(29/44)*100=66%	(24/52)*100=46%	(53/96)*100=55%
NOT GIVEN	2	3	5
UNCLEAR	-----	• *a desvantagem será talvez a competição das notas entre os alunos* • *muitas desistências por parte dos alunos* • *por vezes não compreendo muito as ciências* • *perda de tempo noutras disciplinas* • *podemos confundir algumas coisas*	5

* mistakes have not been corrected

I – Examples of non-structured Observation extracted from the Researcher logbook

MYSELF = the researcher (used as a pronoun or an adjective)

04/11/2015 before lunch

Visit preparation: booklet (short site texts and multiple choice questions) and map (Geological map and English descriptions) from the Arouca Geopark, sent late by the centre and shared immediately with the colleague; booklet project (to print at school and deliver to students) with 1. a few lines about the visit (to link with the project), 2. description of the geopark in English (to connect the subjects), 3. texts of sites in Portuguese (not to frustrate), 4. multiple choices, 2 in PT and 1 in EN [during the visit] + writing as a news (genre developed in classes of Portuguese and answering the WH questions studied in English, even though they still do not know the past) / "I didn't know that…" (sentence welcome by Eng-old, as MYSELF suggestion to make explicit a sort of "conceptual change", fostered by Sci-new with human body in classes of Science in "systematic manner with mis and post conceptions") / diagram with variables / pictures (taken by a professional father) to choose as representative of the experience and to write a scientific legend of (Sci-new noticed students have difficulty in this aspect) [when Eng-old is supported by Eng-new in the project hour]. Possibility for the Science teachers of hard walks to propose to students and the English teacher seems to accept if possible.

Lesson planning: shown some slides (normally readapted/integrated) by Sci-new to Eng-old to introduce the topic of Coal and Petrol formation; Science teacher aware of the importance of process (MYSELF idea of using perfumes for volatile substances → what happened with the boiling process), English teacher concerned with specific terms (MYSELF idea of asking students for compact definition → students responsible for new words not said).

Research collaboration: at the moment Sci-new does not feel comfortable in a regular presence (both in "*as aulas de Ciências em Inglês*" and "*as aulas práticas ou não desdobradas*"), because of novelty of school level, foreign language and other tasks of hers; Eng-old believes it is important, at the beginning, "*mais intervenção menos observação, mesmo que o teu interesse seja diferente*" for students to accept our presence in project and for teachers to feel we are collaborating with them…and to let us be in (Sci-old wants me more in cultural happenings, even though MYSELF clarification that Culture is possible also with Science)!!

Material preparation: "*rochas volcánicas plutónicas*" → in depth intrusive igneous rocks…besides key terms, words have to be useful both in Science and English; "*dobras e forças distensivas*" → folds and forces with divergent direction…within appropriate words, description somehow supports student understanding and learning (MYSELF orientation to Eng-old who feels intimidated and overwhelmed with vocabulary…still not clear that is Science with or through English not in: "*aos poucos*"!!).

04/11/2015 after lunch

Commentaries on tests: problem with electricity in test assembling and delivering; text in English translated into Portuguese for the new student; some "*asneiras*" from Eng-old and Sci-old email exchange stayed in the form because of "*atarafadas*".

Impression of classes: 7A is less motivated than 7D (examples of the English verse with Rock words), not always materials or homework but good results; Ep8 was more brilliant than Em8 (example of debate among Life Origin argumentations), not clear if the foreign language engaged.

Material developed: official presentations, to show same pictures as the ones in the book or created from zero for the specific purpose of topics; Earth Science for 7th graders (EP "*mais piada*", because of more hands-on activities and somehow structures/processes description), Biology and Ecology for 8th graders, Human body and Health for 9th graders (EP "*muito puxado*", because of lot of terms and topics appealing students who ask and talk). SOIL/SPHERES – tests with stuff already seen during classes (layers of profile / spheres in hummingbird); PLATE TECTONICS – late drift, evidences and asked "engine to girls and boys"; ECOLOGY – title (to catch students), picture (to let them think), short text (teachers said they ask them first for definition of species, population, community), kind of diagrams (plants = animals only now to cheat on them; here some C-culture that could have been developed); DIGESTION – video and transcription of description with gaps to fill while watching instead of dictation or notetaking; HEALTH TOPICS – long texts + graphs + intensive vocabulary (…could they not ask students for specific words and disease sheets?!?). Films: Dante's peak (geology), the March of Penguin (ecology), [Zeit or Stuff (health)] with questions to answer. She does not agree with the report V format, because she refers she comes from scientific research…anyhow, this is "*Didática de Ciências*" and also "*vocês não são dicionários*", I said!!
Good ideas: presentation of the project activities to parents with quiz on subjects; debate of ideas and funny feedback from teachers, hopefully students can work and judge on credibility; surprise of teachers coming out during the performance; making and not just video on red cabbage as an indicator; experience with earthworms.
Feelings: …start trusting your decisions!! [supervisor] To understand what is my role in research and school or whether I have to behave as a teacher or an observer is complex as well as the note taking vs table filling (Moreira – the beginning is like to set up conditions – Biology); nevertheless, my collaboration with them can help my investigation from them; also…does it make sense to follow also Science classes in Portuguese, besides English Plus and Teacher Planning (problem of borders for context of case)?
Criticism: from that phrase as in Material developed, I can understand her position [co-supervisor]…that day, I opposed my perspective to her but I believe she has good points as in Good ideas!!

17/11/2015

8F – Sci-old and Eng-old (science debate II)

Language: I ask questions and no problem for them to ask "can you repeat?"; they organize their explanations also asking for "*na medida em que…*"; teacher repairing for "to evolute" and eventually corrected into "to evolve"; quiz on Spontaneism with rewarding candies and candies for mistakes proposed by the English teacher.
Presentations: debate after Evolutionism → chinese advocates that the "machine" proves the origins of cells from molecules, serious gradually building good points from unicellular to pluricellular, fluent referring that is what scientists state, MYSELF intervention on video with changes and time, clumsy stating that there are different organisms and climate conditions …, MYSELF claim that "create" sounds strange in that context, fluent telling we can see changes and proofs through fossils. 2 groups on Panspermia (A. texts plus models and video; B. scientist presentation, where VS how, "best theory ever") → rich talk starting almost referring scientists as prophets but then…fluent (false on meteorite and atmosphere and right in evolution present also here) chinese (doubt on organisms surviving in meteorite) serious (shy on how good this theory is then peaceful that they do agree with the process but not the origin explained by evolutionism) clumsy (insisting that there are proofs missing). 2 groups on Spontaneism (A. theory show with Aristotle and Helmont speaking; B. slides and sentences, illustrative pictures, video anti theory, quiz pretty good, did you like it) → not time now…MYSELF "take note of claims for the sake of science"!!
Feedback: Eng-old asks if they know Darwin and Sci-old says not through her but Students explains that the debate is about the origin of life and not species. MYSELF idea that videos should be avoided unless they

comment on or label them otherwise it is just a show; Eng-old means to wait whether they want to use it to show that theories can change over time; Sci-old refers this often happens with panspermists and creationists tend to claim very little; MYSELF thought that they could analyse what claimed nowadays and choose ideas that align more with their theory which is not just love. MYSELF next time: ask why most of them are better opponents than proponents, be careful with science as a divinity in saying with not proving, explanation of fossils versus bible, combining proposals can make big theories.

Interesting: the very fluent girl learnt English just through television and schooling but her easiness sometimes affects her scientific answers; guys a bit in trouble with English/Science can still ask good questions and make valid claims / prepare nice or diverse works; the sweet girl is very keen in making her point even though in Portuguese it would be easier. Classes just with Portuguese tend to be less engaged in this kind of debate so there is likely a theatrical/motivating effect due to the language/project; Sci-old has not problem in me being attending/participating but she thinks that (a)biotic factors "*não têm piada" para mim*"; as today she was expecting another research besides me, it seems she likes to have audience [9F and "borderline behaviours", some very good kind of reproducing their own problems…too much study too!!].

7A – Eng-old and Eng-new (report reading)

Writing: single words, input for sentences, meaning of a specific part; some do not call me even when I am close to them, others probably need to see that I understand also their own language; short look to set of sheets and MYSELF idea they could have a more organized vocabulary as well as remark reasons in descriptions.

Reading: almost all couples read their text (spontaneously divided) and teacher comments on (what is missing, highlighting good details, involving the audience, linguistic aspects); they will refine texts at home and write a collective conclusion next time; MYSELF making them noticing conclusion characteristics / to see verbs / date of an event.

Important: class whose members have been probably "manipulated" by their parents (more extrinsic motivation than intrinsic) because they show a certain resistance, little enthusiasm and mistake fear, but still they achieve good results…and the parallel class is much more involved even if they can be wrong or get worse results!! Discussion with previous teacher and about possible changes; they are not united, can misbehave and would like teacher to speak more their own language. Eng-old is considering the possibility of inverting – in the case of 7D in my favour and to match her plans with 7A ones – Project hour on Mondays with English time on Tuesdays; she does not enjoy in 7A English classes when not participated.

24/11/2015

Science lesson (English+Portuguese)

Before going to classroom, lesson length is negotiated with teachers and teacher is reintroduced to students (next time, better MYSELF sharing before and TEA informing on changes). Apparently, an active student from 8ºF is looking forward for my implementation…have I not been participating?!?

SCI-NEW performing the meaning of "dynamic". THEY try to explain details they know (it was actually written on the first slide) MYSELF make them describe just pictures (attempt of developing an agreement on topic). MYSELF proposing a puzzle game and asking for some steps, ENG-OLD supporting evidences through "logical". THEIR (some students but I tried to listen to every voice) questioning: "~: meaning of fault in relation to layers…" (MYSELF using pointer on picture and hand position) "±EN: the wind is not enough to move the continents" (MYSELF valid question important for theory), "±EN: if the earth is circular then lands meet somewhere else" (MYSELF good point that will explain more), "PT: do they move in the same way?" (MYSELF showing the map and using direction adjectives with them), "~: plants or animals could not go that far!" (MYSELF exaggerating intonation to make them feel the logics), "EN: where Europe is when Gondwana is shown…" (MYSELF clarifying that it is just a part of the map). Diagram with blanks for them and arrows to

invert: recalling information also using the board (useful for their annotations) + asking why the inversion is meaningful (explaining/explained to be better developed…). SCI-NEW, introducing a future supercontinent; MYSELF, repeating the puzzle game backward and forward, trying to reason. It is not easy for them, cognitively, in both subjects; I tried to make code switching possible.
I wonder whether it is better or worse all those teachers being in the class (first 45', Eng-old +Sci-new+MySelf; second 45', C+V). It takes a long time for the double process of: Language negotiation and Science construction…sometimes (Science) teachers feel like "*elas dar a resposta*". They do not spontaneously take notes, needing to be focused. NO videos and proposals SI gesturing and prosody. MYSELF, visualising linguistic aspects; ENG-OLD, is she going to use them?!? She asks for the presentation (consistency) but changing it (defensive)…to be explained tomorrow, languages and proposals too!!
Hour project (Eng-old+Eng-new; Eng-old)
7A (fossil fuels): she sounds definitive being fed up when they do not deliver the homework and because she thinks they do not make the effort and take the risk in English; introduction-reading-watching-rewatching-answering-writining-explaining; from Science difficult concepts to describe even in their own language so examples closer to them would help [used math symbols].
7D (delivering of letters for penfriend + song mention + report reading + fossil fuels like above): detailed WH reports / even asked if 3rd person is correct / description and emotions / "cats and dogs"; teacher congratulates them for working, a small conflict is passed over; hands up to answer / fast in replying and noticing typing mistakes / question on oil killing sea animals which could build up oil again [disabilities].

[08/12/2015…an email exchange; typographical mistakes were not corrected]
Olá,
então, acrescento a cor-de-rosa, as minhas opiniões, colocando-as a seguir à vossa conversa anterior. Nas questões que dizem diretamente respeito à disciplina, não me vou meter.... ☺

Amanhã podemos encontrar-nos só ao final da manhã? Tenho tanto que fazer para a Gala de Mérito ... e Testes do 10º para corrigir ... etc....A Eng-old costuma ter disponibilidade, penso que é ao meio dia. Pode ser???
Sim, por mim pode ser!
2. Poderia-se pedir de descrever uma das propriedades em Inglês, mesmo de uma maneira simples.
Não me parece necessário, até porque já é uma matéria inicial e ía alongar o teste. Além disse esse conteúdo não é central.
6. Escrever em Inglês 3 ou 4 termos (escolha livre) da Coluna B?
Não queria incidir em traduções. Sai fora dos objetivos a avaliar na disciplina de ciências e afasta-os das outras turmas.
Concordo com a Sci-new. Penso que o enfoque deve ser colocado na compreensão global, mais do que em vocábulos, em particular.
7.1 Poderia-se pedir de pensar à relação entre as variáveis...em Português ou Inglês, não sei.
Não percebo o que pretende, mas gosto sempre de salientar a questão experimental. Era interessante....
Aqui também não compreendi a sugestão da Valentina. Quando vi o teste pela primeira vez, pensei em colocar esta parte experimental em Inglês, contudo, diz-me a experiência que eles ainda têm poucos meios linguísticos para estruturar respostas mais longas e descrever processos. Devemos, de facto deixar para mais tarde... Concordo também com a Sci-new em deixar a 8.5 em Português... era eu que já me estava a entusiasmar...
8.2B acho que a ordem deve ser mudada - OK. Já alterei, foi erro e não alterei - copy paste...
8.2 C adicionaria "(ambos combustíveis)" . OK Coloquei só "ambos"
8.3 D adicionaria "da Terra" OK
Texto do grupo II: mudaria para "...foi um dos primeiros..."
Coloquei assim....."Wegener foi o primeiro cientista a propor, de forma coerente e sistematizada, a hipótese

3. e 4. Estendaria as respostas mais curtas ou cortaria a mais comprida.
***OK - percebo, mas acho que seria mais correto cientificamente** rochas iguais são encontradas em diferentes continentes*
Aqui poderia-se pedir de argumentar uma evidência, por exemplo a paleontológica, em Inglês.
Parece-me cedo para eles e para mim corrigir um texto construído em inglês.
Concordo, pelas razões que referi acima
Há duas questões com o número 5; também, mudaria a primeira para uma explicação e não concordo totalmente com a segunda. Foi lapso, já corrigi
também dei por ela
7. Será que se deveriam fornecer algumas palavras chave que deveriam estar no texto a compor?
Não costumo guiar-lhes a resposta. Que achas Eng-old?
Pois.... depois os meninos dizem que as professoras são do secundário e são mais exigentes... (Valentina: this is a private joke going on between Sci-new and me - forget about it!
Eu também não sou a favor de em momentos de teste se guiarem as respostas. Acho que isso pode acontecer durante as aulas para os ajudar a perceber como se estrutura um texto e que aspetos são relevantes, mas não no teste, sob pena de eles não desenvolverem a capacidade de autonomamente selecionarem informação e a organizarem coerentemente
Entretanto, já tinha colocado em Inglês as questões dos grupos 8 (1 a 4) e II (a multiple choice) , pelo que envio o doc. Se tiver que se mudar alguma coisa, logo se vê.

Bem, acho que falamos melhor amanhã...
bjs para as duas

19/01/2016 (more structured fieldnotes)

Nº, what	**DESCRIPTIVE**	**REFLECTIVE**
7ºD, SCI-EP	Students ask questions on the test contents in Portuguese and Teachers demand English for next time. Lot of face/hand gesturing as well as pointing at the model.	They should be more flexible with code switching… still, they orient understanding!!
	From the chemical model (Crust/Mantle/Core) to the physical → mechanical one: explanation of spheres with their behavior. Short texts to support students in describing the layers/spheres; SCI-NEW states she never does it in Portuguese. From facts to reasons: why do we have layers? Video from MYSELF instead of hers because it is good…complicated but explaining, but a girl: I don't understand the reason of layers…MYSELF: what happened to the colour of the water with and after a storm?!?	I believe that students should try to express their associations. To be (litho and asthenosphere) → To have (mesosphere) → One line (endosphere); it would be good, indeed… She uses MYSELF video and question as in the email…I guess she could have stopped it before. She wants MYSELF to stay for next activity but "we have Sci-old now"!!
	Matter (earth) ≠ Contents (test) Uppermost (layer) = the one that… To flow…what does it flow? P, T: to increase ↑and to decrease ↓	ENG-OLD good manners of mediation…more recalling from rocks could also help to formulate sentences in English.
8ºF, SCI-EP	Worksheet with cycle diagrams (taken from their textbook) to fill in (from "water cycle" to "more cycles" never had before, next time Teacher will explain to Students). "*traduzir é terrível às vezes*"	The idea is to make them prepared to better participate in the next lesson… In MYSELF opinion (SCI-OLD did it already

		and ENG-OLD with a few doubts), the important is them becoming able in not translation but description!!
	Students working – individually, with the peer or in groups – Teachers going around to support / write down / indicate on the book.	I feel they rely on MYSELF: helping them with *infiltração* → infiltration using *informação* → information, synthetising some concepts, using right word order, chemical symbols, etc. Teacher said they asked about MYSELF.
GEN	SCI-OLD and ENG-OLD decision not to cover all topics through CLIL rather just some activities/sessions.	I think this is a "healthy" idea for students and teachers, as human body and health can turn very specific and heavy in vocabulary.
7ºA, EP-HP	MYSELF reminding the importance of their participation to the questionnaire in constructing knowledge, still thanking whom already answered!!	
	Recalling parameters/features/nomenclatures for "the Layers of the Earth". Singing the song with little increasing participation in the refrain. Work of students and teachers around on substantives/expressions/constructions/adjectives: from Portuguese language to the English in the lyrics.	Good idea to capture them!! Retrotranslation; needed MYSELF clarification on "salty sea", "tectonic shift", "ice caps", etc.
7ºD, EP-HP	Last reading "Christmas Night" of Charles Dickens and issues of moral through students' ideas	
	Singing the song "the Layers of the Earth"…the whole class engaged in moving, singing, feeling!! Same work on vocabulary as in 7ºA previous lesson. Discussing MYSELF/ENG-OLD on ideas (set of terms for layer description / a trip to the core of the planet) to make students move from oral to written competence.	I thought students in the other class participated… Different ways: checking on the sheet or recalling words they know. I wonder if they are improving in Science in a similar way as in English?!?
GEN	ENG-OLD asks whether we need to talk as tomorrow I will not come for planning together; MYSELF reporting that planning conditions and reciprocal trust are becoming established and questionnaire answers will be discusses when the process in complete. Reporting on past "creative writing" experiences such with Volcanoes in 8ºF, asking for scientific terms in made up stories.	Somehow, confirming MYSELF role in the project/programme… Thinking on how to match the scientific story, everyday perspectives and practice of language.

[26-27/01/2016]

Sort of narratives, leaving some details out?!?

In the car. ENG-OLD: I am very open to observers like you in my classes, but I feel intimidated by the presence of a video-camera filming…if they are not my lessons [SCI-EP with Sci-new or Sci-old], as long as they agree, for me it's fine!! MYSELF: I see those classes as also yours, but maybe you feel as a scaffold rather than a pivot!! ENG-OLD: yeah…in the planning of those lessons – besides trying to share all resources to deploy – I work on what I can do with English to foster the learning of Science. MYSELF: this is much

more as in labelling terms, using symbols and making drawings you work on languages and representations which are part of Science studies besides the English language…indeed [reporting the difficulty of mother tongue in "*cisalhamento*" or the multiple levels in previous diagrams], the diverse languages embedded in Science should be a part of teaching!! Thus, the CLIL approach has a potential to improve subjects, like you do in EP-HP supporting scientific learning. ENG-OLD: I believe that EP-HP are very important, mainly for 7th graders to enable them to understand and get independent…now with 8th graders we are going over Science topics: in sexual education, they have to dramatise values and reactions of teenagers…when EP was with History, I could think about more links, for example hominid → Lucy → Beatles → music MYSELF: it's interesting 'cause this is also Science for me…by the way, don't you think that for 8th and 9th graders HP could be turned into EP extended also to practical classes?!? I mean, with the presence of both teachers in T/P lessons [or rather CLIL in Science lessons without English teachers as a HP] ENG-OLD: the organisation is complicated and you can already see a certain effort… you have a lot to research/reflect on, that is the job for you now MYSELF: as for the filming, maybe I can use my laptop which is much more discreet…I sat that as sharing with teachers is important.

On the phone. SCI-NEW: I have changed some strategies because I was expecting a higher student proficiency in English and a greater responsibility with the EP project… MYSELF: I appreciate your work on making the C transparent and L visible, agreeing with authors stating that Science has a sort of FL even when the mother tongue is used!! SCI-NEW: they are a bit behind in comparison with other subjects, but also we expect a lot them being already good; I'm also making them reflect on their learning and a lot needs to be done: also the ones mastering the language are not always able to mobilise knowledge MYSELF: I would say that this is a complex process – independent from the language used – you can observe also in your older students SCI-NEW: yeah…I cannot understand how some students do not really have a method of studying?!? MYSELF: it's a matter of time but I believe that both Science learning and English practice can benefit from working on/with multiple representations and fostering the student production/modelling; moreover, this helps the organisation of information – somehow suggested by students in questionnaire – and is a fundamental feature of our subject. SCI-NEW: maybe we can organize together the practical lesson on volcano models…MYSELF: sure, and we'll have the planning moment in a couple of weeks; is it possible to film your lessons, by means of my laptop in a corner? SCI-NEW: we could do it in the practical ones, 'cause I don't feel good when speaking English MYSELF: I guess it's a good idea and I can be the EN canal and you the PT one…in the literature the code-switching and reciprocity between languages are not forbidden!! SCI-NEW: I would like to observe Sci-old who is more experienced in CLIL / I feel that with Eng-old there is an invisible understanding during EP / our collaboration is very important…MYSELF: you are doing well because of your constant questioning / that is clear from my observing / I am also learning, as a Science teacher as an educational researcher as a person!!

Extracted from 16/02, 23/02 and 01/03

8ºF (video-recording)

☺ Plurlingual and researcher/cultures/resources: more than one third is willing and manages to write in English; many would develop a translanguage between Portuguese and English ("*portugalês*"); some prefer to use just Portuguese. They tell me - after classes and linkages being developed through English - using Portuguese their experience or connections with the Italian language (and culture somehow). Concerned/Appealed by the filming, they ask where I'm going to show it; it will be used just for getting information during the analysis with my supervisors!! Use of textbook in Portuguese to participate the lesson in English. Adaptation of the language of computer to the ecology topic. Most of times, use of mediation from the English teacher as well as visualisation of scientific concepts such as "volcano flanks" or

symbolisation like balance ≠ imbalance or abiotic ≠ biotic. Attempt to engaging also the shier side of the class...

☹ Plurilingual with scaffolding/cultures/participation: phenomenon/a, alga/ae, fungus/i...worderful occasion to work on other languages not exactly enjoyed; similarly for to predict and to replace. Concepts (landslides, drought, etc.) could be made explicit by using pictures, as well as diagrams should be commented by students. Other "cultures" such as american trees or portuguese events can be better explored. Long time in copying sentences from slides, which is not note taking neither learner production of language. Missed work on: to affect which is not to entail, physical environment as opposed to natural disturbance, growing community and balance of species. Some challenging questions from the less active students not heard or passed by. Some issues could be used as light homework to hold students on learning!!

<u>7ºA (video-recording)</u>

FIRST 45': preparation of space and materials; kind of resistance from students with me; simple adjectives; accident/opportunity of water in honey more or less worked (relationship with the composition variable); increasing or decreasing order just translated; difficult question on numerical speed plus calculations; almost no time for writing; recalling with volcanism not possible. Teacher asked for cancelling the video.

SECOND 45': material already prepared; kind of welcoming my proposals from the student side; specific adjectives; possibility/facility of heating and making connections (relationship with the temperature variable); sentence formulation about order; eliminated question on speed but matter of plurilingual terms; some time for writing; recalling with volcanism not possible. Teacher motivated in keeping the practice.

<u>7ºD, first Sci-new+Eng-old+MySelf, later Sci-new+MySelf, audio-recording</u>

Digo-te…ter 5 turmas, de projecto…é mesmo puxado!! Requer muita preparação.

Posso utilizar a gravadora? Hoje, não vale a pena…ok, pode porque vamos rever a ficha da atividade.

SUMMARY: correction of homework; conclusion of experimental activity; more content on volcanism. SCI-NEW: combining concepts with gestures; first time drawing; moving through the classroom; showing a picture (pyroclastic flow) and representations (volcanic shapes). ENG-OLD: remarking words on the board; pointing at objects (vent on the ceiling); drawing simple stuff; provoking knowledge (pretending she needs help for a test). MYSELF: wrong "sore throat" and "date of their activity"; as soon as Eng-old has to leave because of a report for Sci-new, I become the English teacher with Science experience (suggesting to symbolise with arrows up and down; writing terms; questioning concepts; asking for finding information on the textbook; tricks for easy translation). STUDENTS: looking around; asking individually; repeating suggested answers; asking for Italian words; participating. WORKSHEET: asked for changing "in" into " on"; added other "influence" explored in the experience; not deep understanding on key words (why those three); delayed calculations for next time; developed some sentences through Portuguese; not questioned the meaning of longer (both time and space); code-switching between me and them and according to them.

Alguns alunos têm dificuldade em relacionar a experiência com a teoria…de um inquérito sei que eles preferem aulas expositivas. Professora que filmou espantada com a variedade de vocabulário utilizado pelos alunos. Não se esqueça que o nível cognitivo deste ciclo é diferente que dos alunos do secundário…Se calhar me devo centrar mais neles e não nos conceitos!! Preciso de planificar individualmente, mesmo que sempre vou detrás dela…Queria lhe passar as gravações da aula prática com estes.

<u>7ºA, Eng-old+Eng-new+MySelf and 7ºD, Eng-old+MySelf, audio-recording</u>

Sim…podes gravar?!?

O José foi-se à biblioteca porque não lhe correu bem o teste de Português … o presidente da turma, que o convença a cá vir.

SUMMARY: conclusion of previous lesson (worksheet I helped to developed); volcanism through an animated guide (other activity she thought about). Being the Science teacher with English experience, MYSELF (besides their actions)…explaining solidification, questioning students, suggesting homework (7A); José and question on time to erupt, João and question on acid with lava and trying to understand, question, state (7D). (Un)explored the ("I can see people … -ing" and) "we might have heard".
Amanhã não vou à planificação, porque me parece que a Sci-new precisa de tempo para refletir sobre o episódio do chorar…respeito!! … Eng-old, que também concorda com a metáfora do médico e a nossa responsabilidade se não tomarmos o que disse.

[29/02/2016]
SCI-OLD will give scientific subject in Portuguese but student works will be presented through English (8º) as well as theoretical lessons are in Portuguese but homework or worksheet are understood if through English (9º); ENG-OLD and MYSELF believe it can represent exercise/challenge for students in autonomously "transferring" information from PT to EN.
SCI-NEW and ENG-OLD are planning a cinema session after tests and before holidays, like an actual cinema (popcorn, included) and about a trip through a volcano...where MYSELF are going to be?!?

[14/03/2016]
Asked teachers to write down doubts/problems/issues they want to solve through my visit in Barcelona and Madrid university and their CLIL research centres.
SCI-OLD available too in sharing her assessment (*avaliações*); ideas (*sugestões*) for test as requested by SCI-NEW. Together with ENG-OLD I am planning some activities for the 10th of May and LALE/LEduC class visiting…
Emailing before Easter!!

[23/03/2016]
Recapping: seen as the English teacher with Science knowledge and being the Science teacher with English experience, MYSELF have been accepted as a colleague and introduced as a partner as well as very welcome to bring and film culturality; involvement in Lesson implementation and monitoring, Planning, Test design, Assessment performance, Diplomacy, Visit proposal and organisation and sharing results and solving doubts as a researcher.

[04-05/04/2016]
Sci-new broke something!! She phoned me back and told the dynamics of the accident; her doubt for me to ask during my study visit; probably EP will be interrupted for 7th grade classes. Eng-old will not come back early because of a meeting; she will write down doubts related to the CLIL approach. Sci-old will send her assessment of 8th grade classes and she cannot really film debates (45´+45´) whose preparation/presentation will be considered as the "practical work" for this last term. I did all my best…

[--- years after ---]

[day when observation was directly not at school]