

THE CLIL APPROACH IN HIGHER EDUCATION: A COLLABORATIVE SMALL-SCALE EXPERIENCE (WITH A FOCUS ON MATHEMATICS AND PSYCHOLOGY)

Silvia Pellicer-Ortín, Alberto Arnal-Bailera,
Miguel Ángel Marco-Buzunariz, Lucía Tomás-Aragónés
Universidad de Zaragoza

Abstract

This article presents the interdisciplinary experience carried out at the Faculty of Education of the University of Zaragoza among the Departments of Mathematics, Psychology and English Philology. This small-scale experience is contextualised within the rise of bilingual programmes both in Europe and Spain and, after having noticed a gap in the research carried out in higher education, we propose the study of: i) the students' perceptions before and after receiving the content instruction in English; ii) the specific aspects related to the areas of Didactics of Mathematics and Psychology; iii) a quantitative and qualitative analysis of the differences between the results and task performance in Spanish and in English; iv) the elaboration of some guidelines for future improvement. This study has been interpreted in the light of the current bilingual approach of CLIL, which promotes a holistic teaching-learning process of both language and content.

Key words: CLIL, interdisciplinary, Primary Education, University, Mathematics, Psychology, English Philology

Resumen

Este artículo resume la experiencia interdisciplinar llevada a cabo en la Facultad de Educación de la Universidad de Zaragoza entre los Departamentos de Matemáticas, Psicología y Filología Inglesa. Contextualizamos esta experiencia dentro del auge de las enseñanzas bilingües tanto en Europa como en nuestro país y, tras haber detectado un vacío en las investigaciones llevadas a cabo en los niveles de enseñanza superior, proponemos un estudio de: i) las percepciones de los estudiantes antes y después de recibir esta enseñanza a través del inglés; ii) las especificidades propias de las áreas de Didáctica de las Matemáticas y Psicología; iii) un análisis cuantitativo y cualitativo de las diferencias en los resultados y consecución de tareas en lengua española e inglesa; y iv) la elaboración de unas líneas de mejora para el futuro. Este análisis se ha interpretado desde el enfoque actual de enseñanza bilingüe CLIL, el cual aboga por un proceso holístico de la enseñanza-aprendizaje de lengua y contenido.

Palabras clave: CLIL, interdisciplinar, Educación Primaria, Universidad, Matemáticas, Psicología, Filología Inglesa

1. Introduction

Throughout the last twenty years, Spanish Universities have increasingly offered subjects, modules and even degrees in which content is taught through a foreign language, mainly English. There are a variety of factors that have contributed to this phenomenon (Coyle, 2010: vii-viii), but the most important ones have to do with the key goals of improving graduates' future employability and fostering the internationalisation process of the degrees so that foreign students may be interested in attending courses in our country, together with the aim of enhancing the language communicative skills in the Spanish undergraduate students.

These bilingual programmes may be framed within the so-called CLIL approach which, according to Coyle, has experienced an explosion of interest “in Europe and beyond, as many teachers, learners, parents, researchers and policy-makers have realised the potential of CLIL and interpreted this potential in very different ways” (2010:ix). The adoption of the term CLIL –Content and Language Integrated Learning– took place in 1994 (Marsh, Maljers and Hartiala, 2001) within the European context, and it meant the fusion of elements which had been previously fragmented but which have come to be reunited in the curriculum. CLIL has also been developed as a ground-breaking form of education in response to the demands and expectations of the Knowledge Age, the era of technology and globalization. Yet, it should be pointed out that bilingual programmes are far from new as they have existed in those regions and communities making a dual use of languages for a long time. The novelty of CLIL resides in its strong political basis in the European Union’s vision of a multilingual Europe where people can function using two or three different languages responding, thus, to the increasing demand of multilingual workers. Therefore, the definition of CLIL that will be borne in mind throughout this study is the one coined by Coyle, Hood and Marsh as “a dual-focused educational approach in which an additional language is used for the learning and teaching of both content and language. That is, in the teaching and learning process, there is a focus not only on content, and not only on the language. Each is interwoven” (2012: 1). Although the CLIL approach has evolved into a variety of methodologies, the key principles that should be taken into consideration have to do with the four Cs model, which proposes a more holistic view of the learning processes. According to this model, by teaching our subjects through a non-native language we should not only consider the specific content of our area but also the communicative strategies developed in the bilingual classroom, the cognitive skills fostered in the students’ learning process, and the cultural aspect highlighted by the fact of introducing a foreign language into the content classroom (7).

In Spain, we have observed a growing social demand for improvement in language standards and, thus, our country has actively developed regional short-, mid- and long-term programmes. In fact, Spain has been a pioneer in the establishment of bilingual programmes in those regions – Catalonia, Galicia and the Basque Country – where two official languages have co-existed for a long time. And these previous experiences have been useful to foster the implementation of the current CLIL programmes in which a foreign language, mostly English, is introduced in the classroom, first thanks to the launch of the MECD and British Council bilingual projects (1996), and then, with the progressive inclusion of bilingualism in mainstream schools, always regulated by the Spanish law. As Dafouz and Núñez have explained, the CLIL programmes in primary and secondary education have been implemented in our country “under the regulations of national and regional educational institutions, such as the Ministerio de Educación, Ciencia y Deportes (Ministry of Education, Science and Sports) or the governments of the Autonomous Communities in Spain” (2009:101). Therefore, Coyle has even argued that “Spain is rapidly becoming one of the European leaders in CLIL practice and research. The richness of its cultural and linguistic diversity has led to a wide variety of CLIL policies and practices which provide us with many examples of CLIL in different stages of development that are applicable to contexts both within and beyond Spain” (2010: viii). And, in keeping with this, Spanish researchers such as Ruiz de Zarobe and Lasagabaster have even claimed that, due to the diverse legislation that Spain applies in the field of education according to the model of autonomous regions, the multifaceted “Spanish CLIL spectrum can serve as a dynamic and realistic model for other countries wanting to foster foreign language learning” (2010: ix). Furthermore,

they assert that in our country “CLIL is consolidating as a trend in the autonomous education systems, which are rapidly attempting to conform to the new demands of our globalised society” (xi).

In the region where this small-scale experience has been carried out, Aragón, this phenomenon has enormously increased in the last few years thanks to the approval of the regional law regulating the implementation in bilingual programmes in 2013 (PIBLEA). According to the Aragonese Department of Education, University, Culture and Sport, in 1999 there were just four schools in Aragón implementing the “Integrated Curriculum Spanish-English”, while in the 2015-2016 academic year, there are 247 educational establishments (kindergartens, schools and high schools) with bilingual programmes. The language chosen in these cases is frequently English, but French and German are also introduced in the content classroom. It is the massive introduction of these programmes into our educational community that has brought to light the need to foster and improve the current and future teacher’s training in both their command of the English language and the so-called CLIL methodology.

Consequently, research on the impact and quality of bilingual programmes has hugely augmented in the last few years, more exactly since the 1990s. Yet, although there exist diverse studies on the result of these CLIL programmes at the level of higher education (Coleman, 2006; Dafouz and Núñez, 2009; Coyle et al., 2012; Fortanet, 2013; Strotzman et al., 2014; Chostelidou et al., 2014), it is quite remarkable that research has mainly focused on the stages of primary and secondary education. Thus, a gap has been identified regarding the research on CLIL at the level of University and adult education. Along with this, the existing studies have not particularly dealt either with the areas of pedagogy, which are essential when we consider that “teachers undertaking CLIL will need to be prepared to develop multiple types of expertise: among others, in the content subject; in a language; in best practice in teaching and learning; in the integration of the previous three; and, in the integration of CLIL within an educational institution” (Marsh et al., 2012: 5), or with the specific programmes developed in the Faculties of Education – in our country or abroad – which become the sites where the future teachers are taught to teach not only content but also language. It is our contention that higher education must provide a forum, like the one offered by our project, in which the educational community can discuss the possibilities and challenges that bilingual education in general and the CLIL approach in particular have recently brought to the fore in our University systems.

2. Context

Taking all these premises into account, the Department of Psychology and Sociology has been offering courses taught in English in the Faculty of Education at the University of Zaragoza since the year 2011, and the Department of English Philology has developed some research and teaching lines dealing with the CLIL approach, and the challenges concerning the introduction of English in the content classroom in diverse contexts and at various educative levels, mainly considering the bilingual legislation recently developed in Aragón. All at once, the Department of Mathematics offered a bilingual subject during the previous academic year (2015-2016) for the first time – which led the teachers involved in these various subjects and departments to share their experiences and find some common lines of action.

Thus, the pilot experience presented in this study is aimed both at monitoring our students’ perceptions before and after attending these bilingual courses and bringing the teachers closer to the specific methodologies that should be applied when teaching mathematics and psychology through a non-native

language – enquiries supported by those many contemporary researchers claiming that innovative measures need to be taken to improve the teachers’ “English language competences and, more specially, to acquire knowledge about structures and vocabulary related to the subjects they teach, classroom language in general” (Pena and Porto, 2008:159).

This project that has been developed responding to some initial needs that arose when implementing these subjects: i) the scarce number of studies about the CLIL approach at the University level and the lack of detailed research on the specific methodology that should be followed to teach content *through* English in higher educative levels; ii) the current and future teachers’ need to improve their training both in the English language and the didactic techniques that should be applied to teach key concepts as well as those linguistic English structures that are directly related to some specific content areas (Mathematics and Psychology); iii) the lecturers’ need to collect and examine some objective data that can allow them to improve their teaching skills within a bilingual atmosphere and adapt the subject content to the level and context of their students. Our project was designed to address two main lines of research: on the one hand, we consider that further study is needed to understand why the students at the Faculty of Education have/not chosen the subjects taught in English. And, on the other hand, more research should be done on these students’ learning and cognitive processes within the CLIL classroom by analysing, for instance, some specific tasks performed in class. This way, the main objectives of this study could be listed as follows: i) to understand the students’ motivations when choosing the bilingual subjects in the Degree in Primary Education at the University of Zaragoza; ii) to compare the CLIL students’ opinions about their learning processes with those of the students following the Spanish-instruction methodology; iii) to analyse to what extent the CLIL approach established in these diverse subjects has influenced the students’ performance in some tasks and their acquisition of content knowledge and subject and language skills.

3. Methodology

It should be noted that both courses taught in English were offered only in *one of the four groups* that our Faculty has for the Degree in Primary Education, specifically in the afternoon shift. This fact introduces a bias in the student’s profile, since most students prefer the morning shift and the vacancies are assigned according to their grades in the previous years. That is to say, afternoon students have usually received lower marks in the past. Considering these aspects, 55 students chose the Psychology course and 24 the Mathematics one, probably due to the fact that the latter was offered for the first time.

The “Mathematics Education: Geometry”¹ course was taught in two weekly sessions of two hours each. One of them was devoted to collaborative activities consisting of solving tasks related to the content that was going to be taught in the subsequent theoretical lectures. This way, the students had to reflect – with the teacher guidance – on certain mathematical and/or didactic issues before being formally exposed to them. The other weekly session was dedicated to whole-group lecturing in order to provide further theoretical explanations of the ideas that had been discussed in the previous practical lesson, as well as solving mathematical problems. It should be noted that in the previous years the students’ results in the subject had been satisfactory (85% passed in the 2014-15 academic year).

¹ Referred to as MEG throughout the article

The course on Developmental Psychology² is also taught in two weekly sessions, a three-hour class and another one of two hours. The methodology used is participative and collaborative; students prepare part of the class themselves from material provided to them and some found by themselves. Sometimes, they are asked to present their work to the rest of the class. Group work activities include discussing case studies, documents they have had to read previously, and videos on developmental issues. Students are also asked to prepare a case study of a child they know to describe the developmental areas and discuss individual differences. As happens in the MEG course, the results have usually been satisfactory in the previous courses.

Regarding the lecturers involved in this pilot experience, the population was represented by two teachers of the Department of Mathematics, one lecturer teaching Psychology, and another one instructing the 4th-year students to apply the CLIL approach in the Infant and Primary Education classroom.

In order to achieve the expected objectives, the methodology applied –with quantitative and qualitative aspects– included the following activities:

a) Quantitative Aspects

a. 1) Students' surveys *before* attending the courses taught in English

During the first week of February, a survey was answered by the four chosen groups of students in Primary Education: groups 3 and 4 in the first year of the Degree, attending the courses on DP in English and Spanish respectively; and groups 3 and 1 in the third year, attending MEG in English and Spanish respectively. The main goal of this initial survey had to do with the detected need to gather some relevant data about the English level and the personal motivation of the students when choosing or declining our CLIL subjects. Moreover, the survey included some questions about the possible uses of the English language in their further teaching careers so as to compile some useful information about the future teachers' perceptions about current bilingual programmes. Subsequently, the teachers held a meeting to analyse the results of the preliminary survey and design the subsequent questionnaire.

a.2) Students' surveys *after* attending the courses taught in English

At the end of the academic year, a survey was answered by the two groups of Primary Education students that had attended our CLIL subjects. On this occasion, the main aim was the collection of data about the possible evolution of the students' English level and their appreciations about the CLIL experience. Furthermore, they had to answer some questions about the possible uses of the English language in their teaching careers so as to assess the possible changes of opinion in comparison to the pre-survey.

a.3) Quantitative comparison of the marks obtained in the exam among the 4 focus groups

With regard to the final exam of MEG, a statistical comparison of the marks of each group was carried out by using SPSS. By performing a T-test, we studied the differences between the mean of the final marks in group 3 with respect to the other groups.

a.4) Quantitative comparison of marks in specific questions of the MEG and DP exams

In addition to this global analysis, in MEG we performed a more detailed examination of the marks of some individual questions of the exam (Problems 2 and 4). And, in this case, we compared groups 1 and 3. In DP, the final exam only represented 50% of the final score. The other 50% was obtained from continuous assignments. These included preparing a class, writing and presenting a case study, as well as

² Referred to as DP throughout the article

reading and discussing texts on developmental psychology. Students were required to attend class and complete all assignments in order to sit for the final exam. The syllabus was different for students who are unable to attend class; in this case the final exam represents 100% of the final score. Thus, for the purposes of our analysis, we decided to analyse one of the tasks corresponding to the continuous assessment, since the exams were slightly different between the Spanish- and English- instructed courses.

b) Qualitative Aspects

b.1) Establishment of common assessment criteria

The group of teachers held a meeting in March in order to set the type of tasks to be piloted with the students and to agree on a common set of criteria for their further assessment.

b.2) Assessment of the oral presentations in MEG: Design of a rubric

One of the tasks of the course included the identification and the oral description of the geometrical elements present in a photograph brought by the students. We asked for permission to record the audio of this activity. Together with this, a rubric was designed to assess the performance of the students. Using this tool, the teachers could assess three audio files corresponding to three students in one MEG group. In order to get a representative sample of the class, we chose those in the 10, 50 and 90 percentiles according to their final marks. The implementation and posterior revision with the group of teachers of this rubric was fruitful to check its suitability and to adjust it to our context and needs with the aim of using it both in future academic activities and research.

b.3) Comparison of written tasks in Mathematics (questions 2 and 4 in the June exam)

Following the same criteria, we chose three students in group 1, in addition to the three students we had already chosen in group 3. In each of the 6 cases, we analysed in detail their answers to two exam questions. These questions were chosen by the researchers according to the writing skills needed to complete them. Specifically, we chose the more and the less demanding ones. This analysis helped us to study to what extent the writing skills in English had some impact on the academic results and the students' acquisition of both geometrical skills and knowledge.

b.4) Comparison of written task assignment in Developmental Psychology

An assignment, which consisted of reading Mary Ainsworth's³ experiment on attachment and answering questions on the theory of attachment and the experiment itself, was done in the two afternoon groups in order to be able to compare the results between the Spanish group and the English group. The theory of attachment had been taught in class previously, and the Spanish text was translated by the professor who teaches the Developmental Psychology course.

b. 5) Teachers' sharing of results and experiences

At different stages of the project the teachers involved met in order to analyse and compare the results, improving the assessment tools and extracting meaningful conclusions for the further development of CLIL subjects in the Faculty of Education, which will be discussed in the next sections. Moreover, the team acted as a panel of experts to select the most meaningful activities to analyse.

4. Results and Discussion

³ See the case study in Canetero, M. J. (2006).

Once all these activities were carried out, the most interesting results could be divided in:

a) Quantitative Aspects

a.1) Students' surveys *before* attending the courses taught through English

- In general terms, it can be observed that the students that chose an English-taught course had a “generic” interest in the language, which is not directly related to their professional performance. Yet the professional interest is higher in the 3rd year (22%) than in 1st year (16%).

- It should be noticed that the percentage of students with an accredited level of English – mainly between B1 and C1 level according to the CEFRL – was lower in the English-taught courses (31%) than in the Spanish ones (35%)

- Most of the students thought that the number of English-taught courses was “scarce” (52 %). 78% considered that the degree should train them to teach different subjects in English in Primary Education, mostly Physical Education, Arts and Crafts, Science and Music since they are the subjects that are being introduced in the classroom at the present moment.

- Most of the morning shift students (not enrolled in the English-taught courses) supported the teaching of subjects in English in Primary Education, and only 32% of them thought their level of English was not good enough; in other words, their level of English was lower than B2. A relevant part of them chose the Spanish-taught course because of the different shift (39%).

- The afternoon shift students, who were not enrolled in the English-taught courses, chose the Spanish-taught course because their priority was passing the course (37%) or they thought their level of English was inferior to the B2 level suggested to take this course (52%).

- Students enrolled in the courses taught in English showed some fears; mainly concerned with speaking in public (DP) and the role of the teacher (MEG).

Therefore, it can be noted that, although most of the students are concerned about the need to learn English, this is not a professional worry, as the majority prioritize graduating over the acquisition of different skills and they are not willing to adapt their schedule according to the subjects taught in English. In this respect, they agree with the fact that the Faculty may offer more CLIL subjects and with their increasing implementation in Primary schools.

a.2) Students' surveys *after* attending the courses taught through English: Comparison

- Some changes were identified in the students' fears after taking the English-taught courses: In MEG, the fear about the exam had increased, but the other anxieties had decreased (especially the fear of not understanding the teacher); while in DP all the distress had decreased considerably; mainly the fear of speaking in public.

- In the post-survey the students were asked about the effect of having received instruction in English on their language level: Both MEG and DP students considered that their most significant improvements had to do with the academic use of the language, the acquisition of concepts and the cognitive processes in English. DP students also included oral and written skills in this group.

- Drawing on their opinions about the effects of taking an English-taught course on their marks:

- 69% of the MEG students thought that their marks could be lower. Nevertheless, they acknowledged they had learned the same content or even more than the other students, and they pointed out that they had been working in small groups with a positive impact on their learning process.

- 62% of the DP students thought that their marks would be affected by the language used in the learning process, yet others considered that their marks would be even better when taking the course in English. However, in the end, they acknowledged they had learned the same content or even more while increasing their language skills.

- With regard to the overall view of the experience, we asked the students if they would recommend others to take the course. Most of the MEG students would recommend taking the course in English (62%), but they pointed out the need of holding at least a B1+ or B2 level of English at the beginning of the course. In fact, the B2 level is the minimum required by the Aragonese government in order to teach some content subjects through the CLIL methodology in our Primary schools. Once this level had been achieved, they gave value to the development of speaking skills, the improvement in vocabulary acquisition and the general linguistic progress. All the DP students would recommend the course in English (100%). They highlighted their progress in their speaking and listening skills and praised the role of the teacher in relation to the increase of vocabulary and the linguistic progress. In general, they valued the novelty of learning Psychology and English at the same time.

Consequently, it may be observed that, in general terms, even though they might initially think that their results in these subjects were going to be lower, at the end of the academic year the students valued the experience very positively since they had acquired the same concepts while improving their language skills. In the same way, the majority of the students had been able to overcome their initial fears and they would recommend this course to future students.

- Concerning the convenience of teaching more courses in English in Primary school: Before the term started, most of the Spanish-taught courses students that believed that the English subject should be taught in English (46%), whereas most of the students in the English-taught courses thought that all the subjects should be taught in English (32%), or at least one content subject (46%). After this bilingual experience, both English-taught groups remarked on the idea of teaching one or two subjects apart from the language itself (85%), while the rest of them (15%) claimed that every subject should be taught in English.

Thus, the evolution in the students' view of the importance of introducing CLIL subjects in the Primary classrooms is very significant. Drawing on an initial positive opinion about this issue, a quite solid conviction about the positive effects of introducing at least one or two CLIL subjects in our primary schools can be observed – an aspect which differs from the divided opinions present in those students that have not gone through a CLIL experience themselves.

- Lastly, the students in the CLIL courses were asked about the improvements or challenges that they had observed along the experience. The students in the MEG course expressed that:

- The improvements were mainly related to: the use of English for giving instructions, explaining an activity and using specific vocabulary. The disadvantages had to do with the evaluation and feedback in English. Probably, this was due to the fact that the exam was to be taken in a few days later and they felt less secure about their level of English to perform well in the exam as well as to understand the process of assessment itself and comprehend the posterior feedback provided by the teachers.

- The hardest part had to do with the expression of reasoning (3.2 points in a 1-4 scale) and problem solving (3/4). The easiest part was to interact with other students (2.7/4). These figures point out to similar difficulties regardless of language.

- The main disadvantages they found in following the course in English: the students with a lower English level (especially those without a B1 level) complained about some difficulties with the language. However, they were aware of those from the very first day and they voluntarily kept coming to classes every day.

- Advantages in following the course in English: Working in a smaller group and developing social skills. All of them acknowledge the great advantage that the size of the group means.

In consequence, an entry level of English is perceived as necessary by all the students, even though they agree they have improved their language skills through this experience.

The students in DP expressed that:

- Every aspect improved to the same extent (3.2/4) except for the skills needed when explaining an activity (3.3), evaluating (3/4) and giving feedback (3.1/4).

- The hardest aspect in DP had to do with arguing (3.1/4) and solving problems (2.9/4). The easiest part was interaction with their classmates (2.1/4)

- Disadvantages in following the course in English: They did not see any disadvantage. Occasionally, they talked about difficulties in grasping concepts or getting a deep understanding of some specific contents.

- Advantages in following the course in English: Improvement of their English level, and the fact of following a syllabus with more support provided by the teacher.

a. 3) Quantitative comparison of the marks in the MEG exam (4 groups)

We performed a statistical analysis of the results of the exam in the 4 MEG groups. Figure 1 suggests that group 3 had an overall performance similar to group 4, but this was worse than in groups 1 and 2. In order to check this hypothesis we ran the corresponding t-tests.

GROUP	N	Mean	Std. Deviation
1	62	5,3284	1,83173
2	62	5,5866	1,49493
3 (English)	18	4,4907	1,86051
4	35	4,8029	2,35303

Figure 1. Descriptive Statistics.

The t-test corroborates the initial hypothesis: Groups 1 and 2 had different means than group 3 (90% and 95% significance, respectively). Thus, it cannot be concluded that the means of groups 3 and 4 were different. Together with this, it cannot be forgotten that the timetable appears to be a relevant factor when it comes to differentiate one group from the other and their respective academic performance. Once this aspect is considered, the fact of having attended the CLIL subject does not seem to imply any difference in their academic performance.

a.4) Quantitative comparison of marks in two questions of the MEG exam (Problems 2, 4)

Along the lines of the global results analyzed in the exams, the students in group 1 obtained better results than those in group 3 in nearly all the questions. The exception is question 3, which showed closely identical results. However, when we performed a statistical test, we observed that questions 2 and 5 displayed better results in the morning group (in Spanish) than in group 3 (English), with a 90%

significance. But that was not the case for the other questions. Even though we would have liked to analyze the reasons for these differences (or lack of thereof) for each question, time constraints forced us to focus on questions 2 and 4: question 2 was mostly based on mathematical content, whereas question 4 had mainly didactic content and, thus, required a longer explanation from the students.

We can say that the results of group 1 (morning, Spanish) were better than those of group 3 (afternoon, English). Nevertheless, when we get an insight into the results of each question, this improvement is mainly concerned with questions 2 and 5 (mostly focused on mathematical content), and not with the questions dealing with the didactic content (question 4), where language proficiency had a bigger role. We relate these differences with the fact that, in general terms, the morning students obtain better marks than the afternoon ones.

b) Qualitative Aspects

b.2) Assessment of oral tasks in Mathematics in English through the rubric in step b.1

The analysis of three specific students (percentiles 10, 50 and 90) showed different performances in the same oral task consisting in describing the geometrical elements in a picture. The results (1-4 scale) were the following:

CATEGORY	P10	P50	P90
Plane geometry	2	2	2
Spatial geometry	1	3	4
Relations between objects or between elements of an object.	2	2	4
Fluency and coherence	1	2	4
Oral skills	1	2	4
Graphical support	1	3	4

Figure 2. Oral tasks evaluation

Figure 2 shows a relevant correlation between the results of the oral activity and the written exam, and these variables are also strongly correlated to the different aspects concerning each student's performance at the level of spoken communication and mathematical knowledge. Thus, the results obtained are coherent and consistent with the initial teacher's assumptions while carrying out this activity as well as with the results obtained by the students in the other assessment activities. This indicates that the rubric designed in step b.1 can be a valid methodological tool to assess this kind of activities.

b.3) Comparison of written tasks in MEG (questions 2 and 4 of the June exam)

In question 2, whose resolution implied an especially low presence of written skills, we could observe the following aspects. In the case of students in percentile 10, both showed the ability to correctly carry out the first step of the answer, but after that they exposed a lack of knowledge about the needed content to perform the task. The students in the English group needed to make up their own symbols to substitute words that they did not know, whereas the students of the Spanish group gave longer explanations, which highlighted the difficulties with certain mathematical concepts.

The students in percentile 50 performed correctly the first task, but the explanations were incorrect. The conceptual errors that they made were different, but they corresponded to similar conceptual levels of

difficulty. The student in the English group showed a slightly better understanding than the student in the Spanish group.

Students in percentile 90 solved the task correctly, but they did not properly justify the steps taken. The student of the English group showed a slightly lower understanding than the one in the Spanish group.

Apart from this specific problematic concept, we cannot observe any difference that could indicate that the language is a significant difficulty in the performance of this activity. This finding would endorse those current researchers in the area of CLIL (Mehisto et al., 2012: 138-171) who claim that, if students are adequately supported during the learning process and if the class is organized around pair and group work providing opportunities for negotiation of meaning, as happens in our case, the use of a non-native language in our content subjects does not imply an obstacle for the students' successful performance of the academic tasks.

In question 4, which required a higher proficiency in written expression, we observed that, in the case of students in percentile 10, the student in the Spanish group did not answer while the student in the English class wrote a barely understandable answer, which could not hide a total ignorance about the content in the first section of that question. The students showed, however, a certain level of knowledge in the second part, but the limitations with the language prevented them from giving an appropriate answer.

Both students in percentile 50 showed some incomplete knowledge of the first section, and some deeper knowledge of the second. Therefore, language did not seem to be a problem in this case either for understanding the question or answering it correctly.

Concerning the students in percentile 90, the student in the English group demonstrated some slightly confusing knowledge in the first part, and a deeper understanding in the second one. The English language, thus, did not seem to be a problem. The student of the Spanish group showed a good command of the content in the first part, but his answer did not match the question in the second one.

In general terms, there was some lack in the comprehension of the content syllabus, which was shown by all students. In this case, the English level of the students could even be an advantage, since the difficulty in writing elaborated explanations forced the students to be brief and focus exclusively on the asked items. Again, this would go in line with some current claims made by those CLIL practitioners who explain that, contrary to the assumed belief that carrying out tasks or even exams in English may imply an additional difficulty for the students' performance and transmission of the knowledge they have acquired, students are forced to use their thinking skills at a higher level in the L2-instructed classroom than in the L1 (Coyle et al., 2012: 30-31, 39; Bialystok et al., 2012; Benmamoun et al., 2013). In this particular case, the students in the English groups had to synthesise the information through a non-native language, which forced them to reflect much more deeply about the new content, develop reasoning skills, order their thoughts in a rigorous way, and even develop some meta-cognitive skills about their own acquisition of mathematical concepts and linguist structures. That is to say, in the end, their learning process was more complete and their expression in English was not a problem when they had to provide reasoned arguments like the ones they had produced in this task.

b.4) Comparing results of written task in Group 3 (English) and Group 4 (Spanish) of DP

The assignment, which required reading a text describing Mary Ainsworth's experiment on attachment, understanding the concepts and answering questions and giving opinions, was analysed in both groups and then compared.

High quality replies contained approximately 40 words and included "technical" vocabulary related to the course as well as a full answer of what was asked. An example of an answer is provided: *Attachment is the preferential affection for someone or something, which usually manifests itself in behaviours designed to achieve or maintain proximity to another person (especially the mother) in a sensory contact privilege, to provide security and emotional support (such as distress, anxiety, fear, sadness or guilt), and resistance to separation (causing anxiety).*

Average replies contained between 20-30 words with more than one sentence used in the answer: *Attachment (or emotional attachment) is a special relationship that the Child provides a small number of people. It is an emotional bond that forms between him and each of these people, a bond that drives him to seek proximity and contact with them over time.*

Low quality replies contained between 10 and 25 words and usually had only one sentence, as may be seen in the following example: *Attachment is an emotional bond/connection between individuals (infant and caregiver=parent, providing the infant with emotional security)*

Students were asked to answer theoretical questions and to give their opinion on some aspects of the experiment. In the Spanish group the tendency was to answer all questions in the same manner, without giving an opinion. In the English group, the answers where an opinion was asked for began with sentences such as: *"From my point of view; In my opinion; I think [that]"*.

On the whole, the bigger part of the work done in English was of average level. Five of them were of high quality and very few were of poor quality regarding content. The work done by the Spanish group was very much influenced by an additional text they were given in class to explain attachment. The overall results of the analysis of the content showed that the replies were more homogeneous and less detailed. The work of the English group proved to be of higher quality and the answers offered a fuller description of what was asked of them. Both groups showed good comprehension skills which enabled them to answer the questions on the text. More diverse content was observed in the students' answers. For example, although more grammatical and spelling errors were found in the English group, the ideas expressed were perfectly understood. Additionally, there was more variation in the answers in this group, compared to the Spanish group where the answers were more homogeneous.

5. Concluding Remarks

Going back to our original questions, we can affirm that, in this minor-scale experience, there have not been considerable differences between the subjects taught in English and Spanish in terms of results and the quality of the learning processes. And the differences that have been identified do not depend on the language of instruction but on the students' general performance (which is generally better in the morning groups) and those students' skills that are not concerned exclusively with the linguistic aspects, such as those related to mathematical knowledge (MEG) or the reasoning capacity required for DP. When

considering our initial objectives, we can conclude that they have been successfully achieved. Concerning the students' initial assumptions, we have been able to identify the students' motivations and fears when choosing the CLIL subjects in the Degree in Primary Education, and it has been concluded that the students' initial fears have been overcome at the end of the course. In keeping with this, we have been able to compare the opinions about the CLIL learning and teaching processes with those of the students choosing Spanish as the main language of instruction and, in general, the students have realized that the use of the L2 in MEG and DP has not had a detrimental effect on their marks, as well as having improved their language skills and their capacity to reflect about their language learning processes.

Moreover, we have managed to examine whether or not the teaching of content related to Mathematics and Psychology has had some influence on the students' performance, and it has been demonstrated that the inclusion of a foreign language into the classroom has not been a decisive factor determining the student's acquisition of concepts and skills. In consequence, these results seem to corroborate the ideas exposed by those CLIL practitioners who claim that if CLIL is rightly introduced – through scaffolding, support, peer and collaborative work – in the classroom it should not impede learning (Cummins 1977; Ting, 2010; Ruiz 2011; Coyle et al. 2012; Spratt 2011); on the contrary, CLIL should enhance the acquisition of subject learning by integrating Cognition in a holistic way and allowing students to exercise their Higher Order Thinking Skills (Bentley 2010: 20-22; Mehisto et al. 2012: 169-70; Hanesova, 2014), such as synthesizing, reasoning, analysing and evaluation among others. In addition to this, this project has also allowed the teachers to reconsider the assessment methodology in their CLIL settings (Dalton Puffer 2007: 205-43; Bentley 2010: 95-6), for instance, creating a new adapted rubric; which demonstrates that one of the first aspects to revise when teaching through a non-native language should be the development of assessment practices that do not imply an added difficulty for the student to demonstrate that the knowledge has been acquired, and which contemplate the diverse learning and thinking process that are simultaneously happening in the CLIL settings.

Along with this, this minor-scale experience has implied an added value by fostering the dialogue and cooperation among the teachers involved in very diverse research and teaching fields – such as those of Mathematics, Psychology, and Second Language Acquisition – demonstrating that interdisciplinarity and cross-curricularity deems to be necessary at the moment when both teachers and students need to integrate new knowledge quickly and in a holistic way, think critically, and move in an increasingly fluid and globalised world where new knowledge is constantly in process (Repko, 2008; Borrego and Newswander, 2010; Doiz et al, 2013). The lecturers involved in this experience have not only expanded their interdisciplinary profiles but they have also seen their teaching CLIL practices improved as well as they have developed more adequate instruments for assessing CLIL tasks, whereas they have been exposed to multifarious pedagogical perspectives while they have been more aware of the students' perceptions, something that has become indispensable at all educational levels and at University since the implementation of the EEES. The learner-centred approach (Nunan 1988; Tudor 1993) has thus become vital, and projects like this one draw on the students' perceptions and assumptions to design and improve the curriculum, in particular, the teaching of both content and a second language.

Yet, some lines of improvement have been identified. Firstly, it would be convenient to offer the CLIL subject in the same time slot as the other subjects, as nowadays the CLIL subjects are taught in the afternoon and this has proved to be a detrimental factor influencing students' choices. Thus, if the number

of students enrolled in the CLIL programmes increased in the next few years, the field of research for our study could be broadened and more significant data could be obtained. Secondly, although it has been mainly concluded that the students' English level has not been a decisive factor in their performance, it would be advisable to establish a minimum entry level of the L2 because if there are students with a very low level of the target language this can slow down the learning rhythm of the class, as the data collected in the post-survey have demonstrated. And finally, it would be very positive to implement more training courses on CLIL pedagogy for current lecturers in our universities so that they may not feel lost when going for innovation in their teaching practices. Considering these limitations, this experience could be transposed to other subjects that are still being taught in Spanish in the Degrees in Education as well as to other educational contexts in our University, since it has been demonstrated that the teaching of content through a non-native language brings an added value to the quality of our teaching programmes and enriches the undergraduates' attainment of competences and skills in terms of Content, Communication, Cognition and Culture.

References

- Benmamoun E., Montrul S., Polinsky M. 2013. "Heritage languages and their speakers: Opportunities and challenges for linguistics". *Theoretical Linguistics*, 39, 129-181.
- Bentley, K. 2010. *The TKT Course: Teaching Knowledge Test: CLIL Module: Content and language integrated learning*. Cambridge: Cambridge University Press.
- Bialystok, E.; Fergus, J.; Craik, M. and Luk, G. 2012. "Bilingualism: Consequences for Brain and Mind". *Trends Cognitive Science*, 12 (4), 240-250.
- Borrego, M. and Newswander, L. K. 2010. "Definitions of Interdisciplinary Research: Toward Graduate-Level Interdisciplinary Learning Outcomes". *The Review of Higher Education*, 34.1, Fall 2010, 61-84.
- Chostelidou, D., Griva E., Panitsidou E., and Dinas, K.. 2014. "Fostering multilingualism and providing linguistic diversity in Vocational Education: Promoting the less used languages". *5th World Conference on Educational Sciences - Social and Behavioral Sciences*, 116 (2014), 1348-1352.
- Coleman, J.A. 2006. "English-medium teaching in European higher education". *Language teaching*, 39.01 (2006), 1-14.
- Coyle, 2010. "Foreword", in *CLIL in Spain: Implementation, Results and Teacher Training*. Eds. D. Lasagabaster and Y. Ruiz de Zarobe. Newcastle-upon-Tyne: Cambridge Scholars Publishing. vii-viii.
- Coyle, D.; Hood, P. and Marsh, D. 2012. *CLIL. Content and Language Integrated Learning*. Cambridge: Cambridge University Press
- Cummins, J. 1977. "Cognitive factors associated with the attainment of intermediate levels of bilingual skills", *Modern Language Journal*, 61, 3-12
- Dafouz, E. and Núñez, B. 2009. "CLIL in Tertiary Education: Devising a new Learning Landscape", in *CLIL across Educational Levels*. Eds. E. Dafouz and M. Guerrini. Madrid: Richmond Publishing. 101-112.
- Dalton-Puffer, C. 2007. *Discourse in Content and Language Integrated Learning (CLIL) classrooms*. Amsterdam/Philadelphia: John Benjamins Publishing Company.
- Doiz, A.; Lasagabaster, D. and Sierra, J. 2013. "Globalisation, internationalisation, multilingualism and linguistic strains in higher education". *Studies in Higher Education*, 38.9 (2013), 1407-1421.
- Fortanet-Gómez, I. 2013. *Multilingual CLIL in Higher Education. Towards a Multilingual Language Policy*. Multilingual Matters: Bristol.
- Hanesova, D. 2014. "Development of Critical and Creative Thinking Skills in CLIL". *Journal of Language and Cultural Education*, 2(2) 33-51. Retrieved on: file:///C:/Users/vaio/Downloads/JoLaCE%202014-2-Hanesova%20(1).pdf
- Marsh, D.; Maljers A.; and Hartiala, A. K. (eds.). 2001. *Profiling European CLIL Classrooms: Languages Open Doors*. University of Jyväskylä, Jyväskylä.
- Marsh, D.; Mehisto, P.; Wolff, D.; Frigols Martín, M.J. 2012. *European Framework for CLIL Teacher Education*. Council of Europe: European Centre for Modern Languages.

- Mehisto, P., Frigols, M.J. Marsh, D. 2012. *Uncovering CLIL: content and language integrated learning in bilingual and multilingual education*. Oxford: Macmillan Education.
- Nunan, D. 1988. *The Learner-Centred Curriculum: A Study in Second Language Teaching*. Cambridge: Cambridge University Press.
- Repko, A. F. 2008. *Interdisciplinary Research: Process and Theory*. California: SAGE.
- Ruiz de Zarobe, Y. 2011. "Which Language competencies Benefit from CLIL? An Insight into Applied Linguistic Research", in *Content and Foreign Language Integrated Learning*. Eds. Y. Ruiz de Zarobe, Sierra, J. and Gallardo del Puerto, F. Berne: Peter Lang. 129-153.
- Spratt, M.; Pulverness, A.; Williams, M. 2011. *The TKT Course: Modules 1, 2 and 3*. Cambridge: Cambridge University Press.
- Strottman, B.; Bamond, V.; López Lago, J.M.; Bailen, M.; Bonilla, S.; Montesinos, F.. 2014. "Improving Bilingual Higher Education: Training University Professors in Content and Language Integrated Learning Birgit Research Communications". *Higher Learning Research Communications*, vol. 4.1, 91-97.
- Ting, Y.L.T. 2010. "CLIL Appeals to How the Brain Likes its Information: Examples from CLIL (Neuro)-Science". *International CLIL Research Journal*, vol 1 (3), 4-18.
- Tudor, I. 1993. "Teacher Roles in the Learner-Centred Classroom". *ELT Journal*, 47.1, 22-31.

Note: Special thanks should be given to the Vicerrectorado de Política Académica de la Universidad de Zaragoza and its innovation programmes, since the project of innovation entitled "Análisis y coordinación de la implementación de asignaturas de Didáctica de las Matemáticas y Psicología en lengua inglesa en el Grado en Magisterio en Educación Primaria (PIIDUZ_15_176)" carried out during the academic year 2015-2016 allowed us to retrieve the findings presented in this study.

Dr. Silvia Pellicer-Ortín is a lecturer at the Department of English and German Philology in the Faculty of Education, University of Zaragoza. She has been a Visiting Scholar at the Universities of Edinburgh, Cambridge, Reading and London, and an invited professor at the Université Toulouse Le Mirail. Silvia's main research interests are related to contemporary British fiction, memory and women studies. She is also very much involved in questions concerning innovative teaching methods in high education and the development of bilingual programmes in Infant and Primary Education.

Dr. Alberto Arnal-Bailera is a lecturer at the Department of Mathematics in the Faculty of Education, University of Zaragoza. Alberto's main research interests are related to the study of the Mathematical Discourse in Instruction - specifically the aspects related to the argumentation in the mathematics classroom- and to the assessment and qualifying of written exams. He has carried out several innovative education projects focused in the development of bilingual programmes in our Faculty.

Dr. Miguel Marco is a lecturer at the Department of Mathematics in the Faculty of Education, University of Zaragoza. Before that, he also worked at Florida State University (Tallahassee), Universidad Complutense (Madrid) and Leibniz Universität (Hannover). Miguel's main research interests are algebra and geometry. He has participated in several innovative education projects in the development of bilingual programmes in our faculty.

Lucia Toms-Aragones, PhD, is a postdoctoral researcher at the Aragon Health Sciences Institute (IACS). She is also an associate professor in the Department of Psychology and Sociology at the University of Zaragoza. She teaches Developmental Psychology, and Special Educational Needs and Inclusive Education at the Faculty of Education. Both courses are taught in English. She has done research on Attention Deficit Hyperactivity Disorder (ADHD) and Bilingualism in children with special educational needs. However, most of her research is on health psychology and psychodermatology.

Received: 2-12-2016

Accepted: 15-1-2017