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Teaching and Learning Science in Context

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ABSTRACT

The aim of this study is the design of the teaching and learning process of science activities on the circulatory system. Due to the expansion of the EU and the diversity of languages in Europe, the European Commission has been promoting a multilingual and multicultural Europe. For this reason, there is a greater need for the development of communicative competence in Primary Education, and bilingual education is an ideal way to promote this goal.

Following CLIL approach, Content and Language Integrated Learning, English as a Second Language is used as a medium to teach subject matter content. CLIL consists of a variety of methods used to integrate content and language and it serves to develop knowledge of the subject as well as to improve students' competency in English. Through innovative methods, it allows the recognition of meaning and the use of meaningful language in a particular context. Applying CLIL involved the preparation of specific materials for 49 Spanish students divided in two groups in year 6 of Primary Education in Spain.

The involvement of students in the learning process and their interaction is an essential aspect of this study. This involvement was even enhanced by means

of the use of ICT (Information and Communication Technologies) in the classroom and by the students' active participation in the activities carried out along the process, which fostered motivation, a relaxed setting, teamwork and collaboration in a meaningful context. The materials and suggestions presented here also aim to be a support for bilingual teachers by providing a selection of activities and educational resources for their professional development.

Keywords: CLIL, bilingual education, ICT, motivation.

1. Introduction

Nowadays the development of the ability to communicate in a foreign language is a worldwide social demand, and therefore, the need for a multicultural education has promoted the growth of bilingual schools.

With the expansion of the European Union, diversity of language and the need for communication are fundamental matters. The European Commission has followed a line of investigation on bilingualism and language education since the 1990s, and it is promoting a multilingual Europe. Besides, the Directives of the Council of Europe have stressed the need for children to be competent in three European languages by the end of the compulsory period of Secondary Education and also the importance of beginning to learn the first foreign language in the early years of formal education, as explained in the Spanish project by the publication "Orientaciones para el desarrollo del currículo integrado hispano-británico en Educación Primaria" (MEC, 2006).

Content and Language Integrated Learning programs, CLIL programs, incorporate both Bilingual and Immersion Education where 'subjects, or parts of subjects, are taught through a foreign language with dual-focused aims, namely the learning of content, and the simultaneous learning of a foreign language' (Marsh, 1994). Teaching and learning content subjects in a language different from the learners' mother tongue brings in a wider cultural context, develops multilingual interests, and also trains students for internationalization. Using a foreign language is a medium of instruction which affects the entire learning process of the learner.

Education ministers in the Council of the European Union discuss new evaluation indicators, multilingualism in education, and the integrated guidelines for growth and jobs. They declared that 'This method (CLIL) can contribute to individual and collective prosperity and can strengthen social cohesion. The method thus presents a practical tool for promoting European citizenship while increasing student and worker mobility. A necessity for the promoters that are contributing to the introduction, development, coordination and extension of CLIL has been recognized, as well as the special training of teachers. The exchange of scientific data and good practices should also be encouraged at the European level' (http://clilcom.stadia.fi/1701).

The Luxembourg Presidency of the Council of the European Union hosted a symposium called 'The Evolution of Education in Europe – Multilingualism Opens Up New Perspectives' in March 2005. Luxembourg Presidency conclusions declared that "Specific CLIL training for teachers and educational administrators should be encouraged; including a period of work or study in a country where the target language is generally spoken...Ways of acknowledging CLIL participation of learners at different educational levels are to be investigated" (http://clilcom.stadia.fi/1701).

CLIL "can be very successful in enhancing the learning of languages and other subjects, and developing in the youngsters a positive 'can do' attitude towards themselves as language learners". (Marsh, 2000) However, designing and implementing a CLIL project requires specific training for teachers. Both communicative competence in the target language and training in the content subject are essential for the implementation of the teaching of the Foreign Language in the early years learning. CLIL teachers make a great effort to support students in their learning process so they master both content and language competency.

2. Objectives

The aim of this study is the design of the teaching and learning process of activities on the circulatory system. Following CLIL approach, English as a Second Language is used as a medium to teach subject matter content.

Materials here were prepared for Spanish students in year 6 of Primary Education. The involvement of students in the learning process and their interaction is an essential aspect of this study. This involvement was even enhanced by means of the use of ICT (Information and Communication Technologies) in the classroom and by the students' active participation in the activities carried out along the process.

3. Content and language integrated learning (CLIL)

Content and Language Integrated Learning (CLIL) is a recent teaching approach in second language education. The term CLIL was defined in 1994, and launched in 1996 by UNICOM, University of Jyväskylä- Finland and the European Platform for Dutch Education. After that it has been extended across the continent, and it has been implemented in Asia, Africa and South America since 2000. Nowadays, different models of CLIL programs are designed and applied worldwide.

CLIL describes educational methods which involve learning subjects such as science, through an additional language. In Spanish the word CLIL is translated as AICLE (Aprendizaje Integrado de Lenguas Extranjeras y otros Contenidos Curriculares) by Teresa Naves in her work, "Usar las lenguas extranjeras para aprender y aprender a usar las lenguas extranjeras" (Naves, 2000). The integration of content-learning with (English) language learning can have numerous names, but they all describe the learning of content and a foreign language simultaneously.

CLIL approach is related to *communicative competence* (Hymes, 1972), cognitive psychology and second language teaching (Cummins, 1984; Krashen, 1985). In Content and language Integrated Learning students learn a second language by using it to communicate themselves both with the teacher and with their peers. Students learn the vocabulary related to the subject content, and fluency is more important than accuracy. Language is a tool for communication and the ability to use it involves developing more abilities than just knowing grammar. Therefore, language should be used as soon as possible rather than waiting until the target level is accomplished (Marsh, 2000).

The naturalness and the authenticity of the materials are core features of this approach. CLIL provides students with the opportunity to receive instructions in a second language in a natural way that is difficult to find in the usual classroom, while they experience real-life situations. "It is this naturalness which appears to be one of the major platforms for CLIL's importance and success in relation to both language and other subject learning" (http://www.clilcompendium.com/clilcompendium.htm).

Moreover, CLIL programs develop a positive attitude in the students as language learners, given that they increase their motivation to learn new things. CLIL programs foster group work and collaboration among peers in a relaxed environment, and the achievements of students demonstrate the positive impact of CLIL on the development of language skills. "...CLIL, in which pupils learn a subject through the medium of a foreign language, has a major contribution to make to the Union's language learning goals...It opens doors on languages for a broader range of learners, nurturing self-confidence in young learners and those who have not responded well to formal language instruction in general education...it provides exposure to the language without extra time in the curriculum..." (http://clilcom.stadia.fi/1702).

CLIL gives young learners the opportunity to learn to 'think' in a foreign language and to use it while they are learning the contents of the curriculum, since the focus is not on learning about the language itself. The ability of students to express their thoughts in various languages can have a positive impact on the students learning' process and it can give them advantages in terms of thinking and studying by enriching their understanding of concepts, and by helping them to broaden their *conceptual mapping* resources. As a consequence, CLIL allows better assimilation of different concepts and helps in general overall learning (Marsh, 2000).

In addition, it is important to consider that students have different learning styles, but schools need to standardize what is taught and how the process of teaching and learning is carried out. However, this standardization does not always benefit each child's way of learning. CLIL can give children more opportunities to develop their language skills in the classroom while they focus on the learning topic in such a natural and meaningful way that they almost forget the fact that they are using a foreign language (Marsh, 2000).

4. Science activities for learners of English as a Second Language

The following activities were created to teach the Human body and health, which is a science content target in the third cycle in Primary Education. The two main objectives for students in this unit are: to recognize main organs in the Circulatory System and their functions, as well as to develop an understanding of main body features, nutrition and how to keep healthy.

Most students who are still acquiring English as a second language find it difficult to read authentic texts in the target language; therefore an adaptation was required. Also, `Authentic materials´ such as maps and charts, pictures and materials that the learner perceives as `real´ and not manipulated for teaching purposes were used. Even though these materials might contain certain degree of language control, they help students acquire the communicative competence they need to use the second language in the real world outside the classroom (Nunan, 1988). Besides, according to Krashen, in order to acquire conversational competence, students should receive comprehensible input from 'the real world'. Therefore, materials have been created to prepare students to be able to understand and produce 'real' language in order to communicate successfully outside the classroom (Krashen, Stephen, 1981).

Materials were created for a mixed ability class, and students´ level, needs, and interests were taken into consideration as well as their different learning styles in order to succeed not only in the teaching profession, but in the students' learning process as well. Possible differences were identified so as to take compensating actions. In order to cater for the diversity among the students, different learning centers were organized in the classroom, and both consolidation and extension activities were created depending on the learning needs of the students and their progress.

These learning centers, also called self-access language learning centers are a means of arranging students in different groups according to specific learning aims. Self-access centers can be as simple as a classroom set aside with dictionaries and shelves of paper-based exercises to digital centers with various types of computer- and Internet-based resources. Students can study independently choosing from among different resources that are available. The theory behind this style of learning is that students, especially foreign language

students, learn better if they have a say in how they learn. Self-access language learning is closely related to the learner-centered approach, learner autonomy and self-directed learning since all focus on student responsibility and active participation for his/her own learning. These centers can help students engage in meaningful learning and provide teachers with time to pull students one-on-one or in small groups to target specific academic skills, modify and enrich the curriculum, and better meet the needs of individual students (http://www.mrsmcdowell.com/centers.htm).

Given that children learn best when they are actively engaged, group projects in centers in the classroom were implemented in order to promote students' autonomy and responsibility. Learning centers, such as the computer based center, the reading center and the writing center allow students to learn through self-discovery and facilitate students work in a relaxed environment that is beneficial to small group instruction. Centers can also include competitions and fun and motivating activities which are demanded since they bring a relaxed atmosphere among the students. The combination with movement around the classroom while working on guided or free production activities provide students with a comfortable environment, given that students are free to walk around and check their dictionaries, a science book or even a peer's work. They work individually or with the person seated next to them.

Materials were adapted by means of simplifying its language in order to make texts and activities more accessible to students and to facilitate their understanding. Difficult words were replaced by similar ones in the students' first language. Then, paragraphs were shortened and sentences were broken down. Vocabulary and grammar was simplified by avoiding some of the technical words and by using simple tenses. Background and examples were provided to facilitate comprehension. Finally, repetition was used in order to clarify the texts' meanings. Students' previous knowledge was reinforced and associations with similar linguistic structures in their first language were made. Students' understanding was checked by asking questions, and continuous feedback of students' progress was provided as well. Oral explanations were used to help students clarify materials by providing familiar synonyms.

Here are the activities created for the teaching/learning of this unit.

1. The following activity aims to revisit students' previous knowledge regarding the human body systems while they develop their communicative competence with the support of visual aids. The teacher presents pictures of the different human body systems on the interactive whiteboard and asks seven students to match them with their functions. The time frame for this activity is approximately 10 minutes. This activity introduces the unit on the circulatory system by providing a global picture of the human body systems. Images of the human body and the different organs help students understand their location as well as their function. The personal experience and the information that learners already have is elicited by the teacher in order to build upon their previous knowledge and to be able to provide unknown information that students cannot produce themselves.

   This is how the information would appear on the whiteboard:

   Match the functions of the human body system with the corresponding picture and write the action words related to each system.

   1. *Supports and protects the body.*
   2. *Pushes and pulls the skeleton.*
   3. *Transports blood.*
   4. *Controls the functions of the body.*
   5. *Processes food and eliminates wastes.*
   6. *Mediate the movement of air into and out of the body/facilitates oxygenation of the blood.*

(Adapted from: http://www.imcpl.org/kids/guides/health/skeletalsystem.html)

2. This activity aims to revisit vocabulary related to the human heart and to develop students' reading comprehension. Students read a text and work on the vocabulary for about 15 minutes. Before reading the text, the teacher asks the students the following questions: 'Why is it so important to keep your heart in good shape?' 'Do you know of any heart problems?' 'How can we keep our hearts healthy?'

After eliciting the information from the students, they read aloud a text on how to keep one's heart healthy. Next, students underline new words or expressions they do not understand in the text and look the new vocabulary up in the dictionary. Then, students write new words on the whiteboard with the Spanish translation. They use a different color for each language and explain ways on how to keep their hearts healthy. The teacher gives an example as a model: 'It is important to keep one's heart healthy, so I want to be active doing sports, playing football and basketball.' 'I want to eat a variety of healthy food, such as fruit and vegetables, and I don´t want to smoke. Finally, students act out how to deny drugs and alcohol in the *Institute*. The aim of this activity is not only to learn vocabulary on the human circulatory system but to learn good habits as well.

Here are the teaching materials created:

Read the following text and underline the new vocabulary. Look the words up in the dictionary and write them on the whiteboard in red and blue.

Keep Your Heart Happy

"Most kids are born with a healthy heart and it's important to keep yours in good shape. Here are some things that you can do to help keep your heart happy:

- *Remember that your heart is a muscle. If you want it to be strong, you need to exercise it. How do you do it? By being active in a way that gets you huffing and puffing, like jumping rope, dancing, or playing basketball. Try to be active every day!*
- *Eat a variety of healthy foods and avoid foods high in unhealthy fats, such as saturated fats and trans fats.*
- *Don't smoke. It can damage the heart and blood vessels."*
  (http://www.kidshealth.org/kid/body/heart_SW.html)

3. This activity aims to develop students listening comprehension and writing skills while they learn new facts about the heart and it lasts for approximately 15 minutes. The teacher dictates the following text to the students. When they finish, students exchange their notebooks to correct

the dictation from the screen. Students copy sentences from the whiteboard and put sentences in order according to the information given in the previous text.

Dictation:

"Your heart is a muscle which pumps blood around your body. This is what happens:

Your blood 'picks up' the oxygen from your lungs and then it travels into your heart. The heart pumps or pushes the blood around your body. It travels through your arteries and goes to every part of your body so your muscles and organs can use the food and oxygen to make them work. Veins carry the blood back to your heart so the blood can be pumped back to your lungs again to 'pick up' more oxygen."

Write the following sentences in the correct order using the information above:

- *Where the oxygen is 'picked up'.*
- *The blood with little oxygen is carried.*
- *The heart pumps the blood to the lungs.*
- *Then blood with oxygen travels away from the heart.*
- *It is pumped back to the lungs, so*
- *Back to the heart in veins, and then.*
- *More oxygen can be 'picked up'.*
- *Through arteries to the muscles and organs.*

4. Students complete a chart of how the human blood flows and play 'hangman'.

   The objective of this activity is to develop students' reading comprehension and their oral skills at the same time they learn important information about the human heart. Students copy and complete sentences posted on the walls around the classroom with a blue-tack. In order to identify the missing words in the text, students play 'hangman' on the whiteboard beforehand. Here are the words students use to play 'hangman' and to complete the text: *muscle, heart, circulation, chambers, receive, pump, separates, ventricle, arteries, beats.*

This is how the information would appear on the wall:

Read and complete the following sentences about the heart:

1. *The heart _____ constantly during our lifetime. In one day your heart transports all your blood to the lungs and to every part of the body about 1000 times.*
2. *Your heart is a _____ about the size of your fist. It is located between the lungs, more to the left than in the middle.*
3. *Your _____ is dark red and it is covered by a resistant tissue called pericardium.*
4. *The movement of the blood through the heart and around the body is called _____. Your heart is a double pump. It pumps oxygen-rich blood throughout your body and oxygen-poor blood to your lungs.*
5. *Your heart is divided into four areas called _____ . There are two chambers on each side of the heart. One chamber is at the top (the upper chamber) and another chamber is at the bottom (the lower chamber).*
6. *Atria are the two chambers at the top of the heart. The heart has a left atrium and a right atrium, and their job is to _____ blood as it comes into the heart.*
7. *The ventricles are the two chambers at the bottom of the heart. The heart has a left ventricle and a right ventricle, and their job is to _____ the blood out of the heart to the body and lungs.*
8. *The septum is a thick muscular wall that _____ the left and the right side of the heart. It prevents the blood from mixing.*
9. *The atria and the ventricles of each half of the heart are connected by a valve. This valve or "door" lets the blood pass from the atrium to the _____ of the same half, and from the ventricle into the large artery connected to the heart.*
10. *The blood moves in your body through many tubes called arteries and veins. They are major blood vessels connected to your heart. Veins carry blood from the body to the heart and _____ carry blood out from the heart to the body.*

5. Students match questions and answers in pairs for approximately 15 minutes.

   Students match questions and answers in pairs. Student A has the questions and student B has the answers. Students who match questions and answers the fastest win.

Read and match the answers to the questions.

Student A

1. *What is the circulatory system responsible for?*
2. *What does the circulatory system consist of?*
3. *Write the two movements the heart has.*
4. *What do we call the two circuits of blood circulation?*
5. *What do cells need to live?*
6. *How much blood circulates in a human body?*
7. *What is pulmonary circulation?*
8. *What is general circulation?*
9. *Name three things you can do to keep your heart healthy.*
10. *What is the function of the heart?*
11. *How often does the heart beat? Why?*
12. *Where is your heart located?*
13. *How big is your heart?*
14. *How many chambers is your heart divided into?*
15. *What is the function of veins and arteries?*
16. *What separates the right and the left side of the heart?*
17. *What does the septum prevent the blood from?*
18. *What connects the atrium and the ventricle of the same half?*
19. *What does this valve do?*
20. *Does the blood pass form the ventricle to the atrium?*

Student B

a) *It consists of the heart and the blood vessels.*
b) *The two movements the heart has are contraction and relaxation.*
c) *The two circuits of blood circulation are general circulation and pulmonary circulation.*
d) *They need oxygen and nutrients.*
e) *About five liters of blood circulate in a human body.*

f) *It is the movement of blood between the heart and the lungs.*
g) *It is the movement of blood to the rest of the body.*
h) *To keep your heart healthy, you can exercise and eat less fatty food.*
i) *The function of the heart is to pump blood to every part of the body.*
j) *The heart beats constantly because if not, we would die.*
k) *My heart is between the lungs, more to the left than in the middle.*
l) *My heart is the same size as a closed fist.*
m) *Your heart is divided into four chambers (or rooms). The upper two chambers are called atria and they collect blood as it comes into the heart.*
n) *Veins carry blood from the body to the heart and arteries carry blood out from the heart to the body.*
e) *The septum separates the halves of the heart.*
p) *The septum prevents the blood from mixing.*
q) *The atrium and the ventricles of each half are connected by a valve.*
r) *This valve lets the blood pass from the atrium to the ventricle of the same half.*
s) *The blood never passes from the ventricle to the atrium.*
t) *It transports oxygen, nutrients and many harmful substances to all parts of our body.*

6. Students match words to definitions in pairs. They play 'memory game'. This activity lasts for approximately 15 minutes. Students discover information about the circulatory system and develop their reading and speaking abilities. First the students read the following instructions:

Match the following words/phrases with the right definitions:

1. *About five liters of blood...*
2. *Blood vessels...*
3. *Circulation...*
4. *Our heart...*
5. *Circulation...*
6. *Arteries...*

7. *Veins...*
8. *Capillaries...*

Here are the definitions:

a) *is the movement of blood through the circulatory system.*
b) *carries nutrients and oxygen to all parts of the body, and collects waste substances, which can be dangerous.*
c) *circulate in a human body.*
d) *works like a pump, and moves blood through the body. It never stops beating.*
e) *are tubes which transport blood through the circulatory system. There are three kinds: arteries, veins and capillaries.*
f) *are blood vessels which carry blood away from the heart to the organs.*
g) *are blood vessels which carry blood from all parts of the body to our heart.*
h) *are tiny blood vessels which connect veins to arteries and distribute blood among cells.*

7. Students get in groups and complete a text by using words related to the circulatory system they find in a 'word search'. Student work on spelling and develop their reading and speaking skills while working together. This activity lasts for approximately 15 minutes.

   Here are the teaching materials:

Find the following circulatory system words in the 'word search' above and use them to complete the sentences above: blood, capillaries, heart, contracts, relaxes, veins.

The Circulatory System

B E P I D H F D W G S V S P S
H L H U U E N P F T W P E O Z
U F O Z F A S U C I G X I S G
L N P O V R W A E W Z I R G Z
B A U E D T R Y X P B I A H Z

L X I O O T U B Y X H T L I S
F N H F N U B U X O R O L Y Q
S F Y O W T M J B Y O L I E W
N S C G K Q D S T Q L F P H H
D U D F A J V A D N C P A R G
Z S F L L T G A R Y A Z C J O
R E L A X E S L B M P L A X N
K G Z I B G K A I S K Z S T B
B T F A H W O I Q G Q R E G A
P F U M I H G M M J I K L Q L

BLOOD
CAPILLARIES
CONTRACTS
HEART
RELAXES
VEINS

(Created from: http://puzzlemaker.discoveryeducation.com/)

1. *The Circulatory system consists of blood vessels and the heart, a muscular organ that pumps* _____ *through the veins, arteries and* _____.
2. *Pulmonary circulation is the movement of blood between the* _____ *and the lungs, and general circulation is the movement of blood to the rest of the body.*
3. *Our heartbeat is a combination of two movements. When the heart* _____, *it pumps blood to the arteries (systole). When the heart* _____, *the blood flows in from the* _____ *(diastole).*

8. Students make their own PowerPoint presentation on the circulatory system in pairs as an evaluation activity. This activity lasts for approximately 60 minutes.

Learners were surprisingly focused while reading and selecting the information from texts in order to make a PowerPoint presentation. This project was one of the most effective ones for the students' learning and the preferred one since students had a purpose for reading, authentic information and real facts were searched and students were given the freedom to choose the information they wanted to include. The purpose of the activity was to develop students' reading and writing skills as well as their communicative competence by giving an oral presentation while making use of new technologies. Students 'learned how to learn' and they developed team work abilities since they prepared the PowerPoint presentation in pairs.

Students have access to samples of PowerPoint presentations, information and illustrations of the human circulatory system in a special folder created for them. This folder can be accessed from every computer and therefore, all the materials students might need to work on their project are easily available. This folder has proved to be more useful as it saves time and students focus on the real learning aim. Although it is important for them to learn how to search for information online, using the computer and looking for images distracts them from the task at hand.

9. Here are possible extension/consolidation activities for this unit. This activity lasts for approximately 10 minutes. Extension activities are designed for the learners who finish an activity earlier. Students watch videos and play games online: Movies, quizzes, articles, word find and a variety of activities on the human heart. In addition, consolidation activities are designed for individual learners according to their personal needs and depending on their progress along the unit.

   The following activity, which has a double aim, includes verbs related to the circulatory system. Students revisit language grammar (the simple present tense) and study the spelling of the verbs included in this unit while having a pleasant time completing a `word search´. (http://puzzlemaker.discoveryeducation.com/WordSearchSetupForm.asp)

S M E W S U R P H S A S C P S
D E M N V T R M T O N K O A Y
R L I K T E R C F R J B N S U
M R G R V E A O U G L X N S K
K D P E R R R T P E P H E E E
V B N D T A E S I S G B C S S
C T M N J R C D S X N C T G E
S O O S E V I E C E R A S G T
E C L T R A V E L S L F R G A
X O S L A B S W O L F H Q T L
A U I P E S E P A R A T E S U
L O Q A M C L Q I M S R T T C
E O T H R U T X O I X R E V R
R S L B J Q P S F G F Y A C I
S E T U B I R T S I D C F O C

Beats, flows, transports, circulates, carries, collects, connects, relaxes, contracts, separates, receives, returns, enters, passes, travels, pumps, prevents, distribute.

4.1. Internet resources on the circulatory system

The following is a selection of interesting and useful websites for teachers to plan their science classes. Furthermore, these resources can help teachers create both consolidation and extension activities, which are necessary for slower students in need to revisit the information in order to grasp the concepts, and extension activities for faster students who finish activities earlier and demand further practice during the class period. In addition, two recommended dictionaries online are included.

– http://hes.ucf.k12.pa.us/gclaypo/circulatorysys.html: This website offers a revision of what learners know about the circulatory system using an

interactive quiz. Information on how the circulatory system works is presented in a clear and organized way for students to read, and with colorful diagrams of the heart, blood and vessels.

- http://www.alfy.com/teachers/teach/thematic_units/Human_Body/HB_1.asp: This website includes great interactive activities relating to the human body.
- http://www.coxhoe.durham.sch.uk/Curriculum/Science.htm: An overview of the Science Curriculum, including the circulatory system, links of useful sites and science experiences are presented in practical contexts.
- http://www.enchantedlearning.com: This website includes very interesting science resource materials.
- http://www.primaryresources.co.uk: This website contains resource materials, including several PowerPoint presentations.
- http://www.scienceacross.org: Science across the world (SAW) is a website which helps teachers find other schools across the world working on the same topic, in the same language. Students exchange topics and any associated materials with their selected schools. They can also download examples from our library. This project gives students a global perspective on their science topic. There are more than 6,837 teachers in 139 countries where students are collaborating on school science topics.
- http://www.smm.org/heart/heart/top.html: This website includes heart animations and interactive activities. Also, lessons about the heart for teachers are available. Students can watch the heart valves at work, view the heart with interactive labels, find the heart with a virtual stethoscope and see the flow of blood to and from the heart.
- http://www.visiblebody.com/tour_what_is_it: It is a complete, fully interactive, 3D human anatomy model of the heart.
- www.sparklebox.co.uk/cll/index.html: This website offers the opportunity to share useful downloadable resources with other teachers around the UK and beyond.

The following websites are an excellent support as consolidation activities for slower students since they offer the opportunity of learning in a more visual

way how the circulatory system works and they also serve as a revision of basic concepts, such as which sides of the heart pump the blood to the body and to the lungs, how the blood oxygen levels differs on the right and left sides of the heart, how the heart functions as a double pump, how the chambers and the valves work in harmony, and how exercise affects heartbeat rate.

- http://free2.sparklebox2.co.uk/downloads/s2b21.pdf: This webpage presents a set of colored diagrams of the heart. It includes a labeled version (simple and complex) for class discussion, as well as a worksheet for students to label themselves.
- http://www.medtropolis.com/VBody.asp: This webpage contains a virtual body that goes through the different regions of the human body. It includes an animated heart and an interactive tour of the human heart which can help both students and Spanish bilingual teachers to learn not only facts related to circulatory system but how to pronounce all the terms related to the heart as well.
- http://kidshealth.org/kid/htbw/heart.html: *KidsHealth* for kids includes a glossary of medical terms, games and information about good health and the circulatory system both in Spanish and in English, which is very useful for slower students or those in need of translation. There is also a body diagram with explanations in a kid friendly format with audio included.
- http://www.ngfl-cymru.org.uk/vtc/circulatory_digestive/eng/Introduction/: This whiteboard activity is a quiz for the whole class and can be used to either reinforce or introduce class work on the circulatory and digestive system. A bank of questions must be answered to get a heart working healthily.
- http://www.mystery-productions.info/hyper/Hypermedia_2003/Abboushi/ Artefact/index.html: The site is an educational multimedia website targeted at the UK National Curriculum students of Key Stage 2, particularly the 9-10 year olds studying biology unit 2d. It merges elements of fun and learning into one, offering unique and highly dynamic interactive experiences. The learning objectives tackled throughout the site include teaching about the function and purpose of the main body organs, and details about the heart and circulation and the pulse rate. *Days*

of Wonder website invites learners to become experts on the heart and circulation by taking over a specialist's job. The first instruction learners receive is the following: *"Flopadom is retiring and he needs someone to take over his job"*.

The following websites are dictionaries, very useful both for teachers and students in order to find the meaning and definition of words but, most importantly, to learn the correct pronunciation of technical words, which Spanish teachers might find interesting.

- www.wordreference.com: Wordreference.com English dictionary includes an English definition, an English-Spanish and a Spanish-English dictionary. Moreover, it is a very useful tool to listen to both the British and the American pronunciation of scientific terminology.
- http://visual.merriam-webster.com/: Webster Dictionary includes an English dictionary, a thesaurus, a Spanish/English dictionary, a medical dictionary, an encyclopedia Britannica, a picture dictionary, games for spelling, and the word pronunciation. The Merriam-Webster's Medical Dictionary provides 30 entries for the term 'heart' such as: heart, heart attack, heart rate, heart valve.

5. Conclusion

As I have already stated, this study analyzes the design of the teaching and learning process of a science unit on the circulatory. The principal conclusions that can be drawn from the theoretical discussions and personal experiences reported in this study are as follows:

CLIL lessons contain elements of content, communication, culture and cognition and facilitate students' development of crucial skills in communication, ICT, teamwork, creative thinking, and evaluation. Both content and language are explored in the CLIL approach; however language is learnt more successfully since the learner has the opportunity to gain subject knowledge at the same time.

The students prefer to learn with hands-on activities and 'fun games', such as matching questions and answers posted on the whiteboard and on the walls

around the classroom. Learning centers and interactive activities were preferred by the students as well as interacting with the teacher in order to receive immediate feedback and correction to succeed in their learning process. Finally, results show that students are aware of the importance of personal study in order to learn the vocabulary and the scientific contents.

Results of the present study indicate that some of the main advantages of content-based learning in primary education are the increase in the number of hours students listen and read in a second language, and the method of learning language in meaningful context. In addition, CLIL prepares for internationalization, improves overall and specific language competence, prepares for future studies, develops multilingual interests and attitudes, introduces a wider cultural context, and diversifies methods and forms of classroom teaching and learning. Finally, language acquisition naturally goes hand in hand with cognitive development. Meaningful learning was supported by videos and images, which are vital learning aids for CLIL programs.

This study implies the importance of the output production, which is facilitated by suggesting communicative and feasible tasks, and by encouraging students to work in different interactive formats such as oral presentations, round tables, debates, as well as by writing letters, papers and making posters. Students' ability to 'learn how to learn', to transfer strategies and independent learning skills were increased by making PowerPoint presentations and participating in interactive activities online. The oral presentation of their projects with animations and sound developed students' oral skills and creativity. Furthermore, the opportunity to interact with a digital whiteboard offers a unique and useful tool for the teaching/learning process.

Many students can recall visual images better than audio; therefore, visual aids are a strong support for CLIL learners in mixed-ability classrooms. For this reason, combined photographs and texts to produce activities have been an essential contribution for the creation of materials. Presentations illustrated essential concepts of the topic and animations contributed interesting factors. PowerPoint presentations served as an introduction to the topic and as a revision technique in other occasions. Slides were easily understandable and provided specific information. They explained the Why, Where, When, and How the human heart functions.

This study also confirms that a learner-centered approach is beneficial to the teaching and learning process since learner needs are of primary concern. In view of the fact that students learn by active participation, students were made participants of the material design and were considered the center of the educational progress. The involvement of students, their interaction and the task-based learning by means of the use of ICT in the classroom, have increased their enthusiasm towards learning science significantly. The classroom layout and the presence of posters, as well as the game `Trivial Pursuit´ which is included in the PowerPoint presentation made by the students, are supportive examples.

The study carried out additionally supports the value of global learning and a cross-curricular approach in CLIL programs. Science topics are connected and integrated into other curriculum areas; especially those taught in English were planned accordingly. This study found that that the science contents which the students learned through their first language assisted them in making the second language more comprehensive. Besides, literacy developed in Spanish and was transferred to English. This can be explained by the fact that contents learned in "Conocimiento del Medio" provided background knowledge to learners. These findings have confirmed other studies (Navés, 1999) that indicate that there is a significant connection between first and second language acquisition.

Providing clear objectives and continuous feedback was found to have a significant effect on achievement scores. This confirms the assumption that the information students receive about their progress inspires them to achieve their best and to strive to reach their highest marks. It is interesting to note, however, that it was not easy to motivate faster learners due to the fact that activities were not always challenging enough for them or because they had finished the work ahead of time. This situation was solved by increasing the number and the variety of extension activities in the classroom.

This finding is in line with many studies which have shown that assessment and continuous feedback contribute considerably to students' motivation. The same occurs with the recognition of students' achievements and positive reinforcement, which have shown to help students to reach their highest potential and to strive towards excellence. Thus, the role of teachers is to assist support, facilitate and create learning experiences in the most difficult moments. This is

carried out by supplying activities that help students to be aware of their progress in their speaking, writing and reading skills in each subject, by increasing their knowledge about their improvements in the most encouraging way possible. (Sanmartí, 2007)

Further research on differentiated instruction and personal assessment is recommended as crucial aspects in a mixed-ability classroom. Students´ learning rhythms fluctuate as a result of differences in behavior and in the degrees of maturity, which make flexible grouping and adaptation of some tasks necessary. Unique student learning styles as well as individual needs and interests are essential characteristics to take into account during the selection, adaptation and creation of materials in order to succeed, not only in the students' learning process, but also in the teaching profession. Additionally, variety and flexibility of both consolidation and extension activities are two general principles supporting the creation of good content-based learning activities.

The study shows that CLIL programs foster student's motivation since they produce a relaxed setting and the learner's participation in the learning process. Contrarily, the stress on teacher initiation and control can, in fact, restrain the active involvement of the learner. (Cummins, 1984). Observing that lower stress levels produce increased learning, CLIL programs should aim to provide a relaxed setting in the classroom and to create an environment of respect and tolerance for shy and outgoing students, as well as for slow and faster learners. Therefore, all learners have enjoyable, productive and memorable experiences of learning science, where students can express themselves with freedom and develop their own personalities.

Designing and implementing a CLIL project requires specific training for teachers, given that both communicative competence in the target language and training in the content subject are essential. And so, more time for coordination among teachers for planning and for the creation and adaptation of materials is required for the program success. Experts on CLIL claim that team teaching and cooperation between language and subject teachers are essential in order to plan CLIL classes successfully. Thus, an increase of ongoing staff development both in CLIL and science during working hours is crucial for effective teaching and learning.

In conclusion, despite the limitations mentioned, the success of bilingual programs in Spain is partly a result of many years of experience combined with the joint effort of the administration, teachers, students and parents. Teachers' enthusiasm and confidence in the program, with the addition of parents' support, has motivated students who are convinced of the opportunity to participate in a bilingual program. It is a crucial fact that students feel more positive about learning, more interested in Science, and more confident about their ability to communicate in English. Moreover, when comprehensive input is provided in an encouraging environment, it fosters content and language acquisition.

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