REVISTA ESPACIOS

The effect of CLIL methodology and web applications in the foreign language class: a comparative case in Colombian schools

El Efecto de la metodología CLIL y aplicaciones web en la clase de lengua extranjera: un caso comparativo en colegios colombianos

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Abstract
The research main objective is to demonstrate CLIL methodology efficacy together with Duolingo and b-Learning in teaching English, in Colombian diverse socio-economic levels in rural-urban contexts. Including motivation, gender, and social class as covariates. Based on a quasi-experimental pretest-posttest design with three groups of students in contexts: Urban (n = 32), Rural-Urban (n = 32) and Rural-Vulnerable (n = 30). The results show that the methodology is effective in all three contexts, reaching larger effect sizes in the Rural-Vulnerable context.
Key words: Duolingo, b-learning, secondary school, EFL.

Resumen
El objetivo es evidenciar la eficacia de la metodología CLIL, en conjunto con Duolingo y bLearning, en la enseñanza del inglés en contextos rurales-urbanos colombianos de niveles socioeconómicos diversos. Se incluyen como covariables motivación, género y nivel socioeconómico. A partir de un diseño cuasiexperimental pretest-postest con tres grupos de estudiantes en contextos: Urbano (n=32), Rural-Urbano (n=32) y Rural-Vulnerable (n=30). Los resultados muestran que la metodología es eficaz en los 3 contextos, alcanzando tamaños del efecto superiores en el contexto Rural-vulnerable.
Palabras clave: Duolingo, b-learning, educación secundaria, ISL.

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1. Introduction

The impact of globalization has generated very prominent changes in the different areas of social formation and knowledge. In the last three decades (Altbach, 2007); An example of this globalized effect is that experienced by the European continent in the 1990s in the area of communication and language, where training in the foreign language was perceived to be subject to a formal positivist scheme based on decontextualized knowledge plots and focused on a final product (Jacobs & Farrell, 2008). The need to undertake new methodologies or alternatives that converge towards improvements in educational results in this area of knowledge is evident, and in turn meet the demand for new levels of multilingualism, the labor market and emerging cultures (Dalton-Puffer, 2011; Eurodyce, 2006; Greere & Räsänen, 2008). One of these emerging methodologies was Content, and Language Integrated Learning (CLIL) that is based on theoretical premises associated with language learning, such as Piaget's cognitive theory (Piaget & Riani, 1983) mentioning that language acquisition depends on the development of intelligence, that is, intelligence is needed to acquire language. In addition to this, Vygotsky's socio-constructivist theory (1978) proposed that the process of learning the mother tongue (L1) and that of a second (L2) basically obeyed the same principles and that interaction with the environment possibly depended social and the level of knowledge development of the individual. Another contributing theory is the Cummins (1981) Threshold hypothesis, which concludes that every language is supported in a context and cognitive demand; and that its process can co-occur. Furthermore, as a significant influence on the establishment of CLIL, there is the theory of creative construction or the naturalistic approach of Krashen (1985), which explains that the acquisition of language occurs naturally, and points out that human being is born with a specific language system. This theory points to five hypotheses in language acquisition; the first, where he describes that there are two ways to develop competencies towards an L2; one of them is to acquire it (it happens subconsciously), and another is to learn it (it is a conscious process). A second, where he argues that language skills are acquired in a predictable order. A third, where grammar rules are like a monitor in the acquisition of L2 (the contents or phrases of L2 appear in mind, are scanned and corrected before expressing it). A fourth, which is considered the core of Krashen's theory, and considers language to be acquired when the human being is able to understand messages since language acquisition is involuntary. Moreover, finally, a fifth, described as the presence of the "comprehensible input," referring to the student's improvement and progress when he receives an input of L2, which is one step beyond his current stage of linguistic competence, which is the presence of the understandable input explains how two individuals can receive the same input in their teaching-learning process in L2. However, one of them reaches progress, and the other does not. Taking up the main thread in CLIL and considering the theoretical premises given by the previous authors, Coyle, Hood & Marsh (2010:1), who define CLIL as:

> Is 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 language. Each is interwoven, even if the emphasis is greater on one or the other at a given time.

Thus, it is knowledgeable that CLIL promotes not only linguistic competence but also stimulates cognitive flexibility. In this way, the different perspectives of thought are the result of this methodology, promoting the effective constructivist educational practice, which has an impact on the conceptualization in the enrichment in the understanding of concepts through the creation of networks of reflective thinking, allowing the student advance to a more sophisticated level of learning in general (Cenoz, 2013; Coyle et al, 2010). In summary, the CLIL methodology establishes an immersion process where the curricular program agendas of the course or subject take the mother tongue (L1) and become taught in a different language (L2), seeking as a purpose a fusion

of the knowledge of the agenda with knowledge of the foreign language. In this way, the acquisition of the L2 is acquired naturally (Gierlinger & Wagner, 2016; Marsh, 2008; Marsh, Cañado & Padilla; 2015).

2. Theoretical Framework

2.1. CLIL in Secondary school

The CLIL methodology has been integrated into the curricular program or program content at different levels of education (primary, secondary and tertiary, among others), and began to be widely used as a means for teaching English as a foreign language and at the same time, teaching of subject content subjects in public and private schools in Europe (Eurydice 2006; Pérez-Cañado, 2012).

An example of this is the research by Navés (2011), which conducted a comparative study through a proficiency test evaluated in public high school students (N = 750) and Catalan semi-private students in Spain of 5th, 7th, 9th, 10th, and 11th. In each grade, he distinguished two groups with CLIL immersion in his Natural Sciences classes and not CLIL (not-CLIL); fifth (101 CLIL and 259 not-CLIL), seventh (20 CLIL and 259 not-CLIL), ninth (50 CLIL and 11 not-CLIL), 10th (16 CLIL and 37 not-CLIL). The findings indicated that students with CLIL methodology surpassed students who were not immersed in CLIL in different skills, noticing a more considerable statistical significance in skills associated with reading comprehension, and with significant differences of less effect on grammatical competence, written fluency and lexical and syntactic complexity.

In Basque Country contexts, Lasagabaster (2011) conducted a cross-sectional study supported by a questionnaire on motivation and language proficiency achieved in L2, to secondary school students (N = 191) with an average age of 15 years. He worked with two groups: one of 27 EFL (English Foreign Language) students and another with 164 CLIL students. The results showed that there is a strong relationship between the CLIL approach and the motivation towards L2. Besides, the oral and written skills acquired by CLIL students were superior.

In Japanese secondary contexts, Ikeda (2013) implemented a mixed longitudinal study for one year. The information collection was divided into two sections, a qualitative one through a questionnaire to evaluate the instruction of CLIL teachers and a quantitative one with pretest and posttest measures through the writing of essays through software in 80 students (ages 16 and 18) with low intermediate levels in English. The results showed that the overall quality in writing skills of CLIL students, based on a variety of vocabulary, grammar, and organization, improved considerably. However, the levels in grammar writing were not improved (more errors per sentence). On the other hand, regarding CLIL teachers, students appreciated cognitive activities more; they mentioned that there was more constructive learning, more excellent knowledge of the content, and an improvement in communication competence (vocabulary and oral presentation). Agustín-Llach & Canga (2016) established a longitudinal study for three years in 107 Spanish primary and secondary school students (4, 5, and 6 grade). The authors measured and compared the size of receptive vocabulary and the lexical growth rate in two groups (students 58 CLIL and 49 EFL). The results showed that the acquisition of receptive vocabulary was significantly higher in CLIL students. Also, their vocabulary progress was better in their next school years, in contrast to EFL students.

In the Iranian context, Moghadam & Fatemipour (2014), in public and private secondary schools, developed a comparative study with a quantitative approach with 123 students aged 13 to 14 years. Experimental Group (GE) was defined as 60 students from a private school, where their training in science and mathematics is instructed with books and the CLIL approach. On the other hand, the public school was the Control Group (GC) with 63

students, where training is provided with traditional methods and materials in all subjects. The results showed that GE had better retention and development of its vocabulary with statistical significance, compared to the students of the GC public school. In the Catalan context, Pérez-Vidal & Roquet (2015) developed a mixed longitudinal study, with pretest and posttest measures during an academic year with 100 Catalan high school students, aged between 13 and 15 years. The GE starts with 50 students (they received Formal Instruction in EFL + CLIL) and the GC with 50 students (they only received Formal Instruction in EFL). The results showed that GE obtained better receptive skills (reading skills) and productive skills (writing skills), showing significant progress in its general lexical-grammatical skills. These differences in their hearing skills were not observed. Similarly, Pladevall-Ballester & Vallbona (2016) established a longitudinal study in 238 high school students in Barcelona in grades 5 and 6 with ages from 9 to 11 years. For a year, they divided the group into two: the GE, where 138 students worked with the CLIL + EFL methodology, and the GC, where 149 students worked only through EFL. The results did not obtain significant differences between both groups. However, it was observed how GE experienced a faster advance than the GC. Thus, the authors emphasize that the benefits of CLIL lie in its full contextualization, but that they are not immediate and instantaneous like the EFL. On the other hand, Dallinger, Jonkmann, Hollm & Fiege (2016), established a longitudinal investigation for a year in 54 German high school classrooms, with 1281 8th grade students in their history lessons. Students classified into three groups (CLIL1: 483, not-CLIL1: 354 and not-CLIL2: 444). The findings reflected that the CLIL methodology had positive effects on listening comprehension in English. On the other hand, the knowledge of history with CLIL students was significantly higher, compared to not-CLIL1 and not-CLIL2 students. In current studies, Pérez-Cañado (2018) developed an empirical longitudinal study with pretest and posttest tests to 2024 students belonging to 53 public and private schools (including bilingual and non-bilingual) of primary (ages, 11 to 12), secondary and high school (ages 15 to 16) of 12 Spanish communities. The individuals involved in the study were classified in 1033 with CLIL methodology and 991 with EFL. The results showed significant differences in language proficiency in CLIL students (scaling as the academic year progressed), with a slightly higher advance in their reading and listening skills compared to EFL students. Besides, CLIL students in public schools improved significantly compared to private schools.

As a preliminary and opening conclusion to this article, it can be perceived that the CLIL methodology has an impact on improving the performance of students in language skills compared to those students subjected to traditional environments in foreign language learning (EFL). Moreover, authors who had interacted with CLIL converge in their studies, in that impact relapses in the improvement of cognitive development, taking advantage of contextualization in the topics covered, in the subjects, and the beneficial effect on motivation.

2.2. CLIL Digital resources and materials used in Secondary school contexts

Before deepening this research, it is essential to define what are resources or materials in the context of L2 learning, and ask what aspects are essential to be considered useful resources in the teaching process of L2? Furthermore, which of these digital materials or resources have been integrated with CLIL in recent decades?

In these ideas order, Tomlinson (2011:66) points out that the resources or materials "they can be anything which is deliberately used to increase the learners' knowledge or experience of the language". Moreover, these materials must stand out in four aspects to be functional in the learning of L2, in the first instance they must be instructive (inform about the language); secondly, they must be experiential (provide exposure to the language in use); third, they must be provocative (stimulate the use of language), and finally, they must be exploratory (facilitate discoveries about the use of language) (Tomlinson, 2001). On the other hand, Information and

Communication Technologies (ICT) have led these materials and resources to follow new directions according to the new digital contexts and the needs of the new L2 student (Bozdoğan, 2015; Tomlinson 2011). Evidence of this is the quantity and quality of digital resources, new programs, and technological courses linked to the learning of L2, denoting interactivity as a determining factor (Cinganotto & Cuccurullo 2016; Durán & Cruz, 2013; Tomlinson 2011). Now, knowing these new digital possibilities of materials in L2, it is necessary to answer which digital materials or resources have been involved with the CLIL immersion methodology. Navarro-Pablo, López-Gándara & García-Jiménez (2019), show a list of resources and digital materials used in CLIL contexts, alluding that their list is still very scarce (Table 1).

Table 1
Classification of digital resources and materials

Type	Authentic/Teaching-Oriented	Example used in CLIL
Hardware (Physical Devices)	Both	PCs, Laptos, tables, mobile phones, interactive, whiteboards, scanners,
Software (Programmes for creating, running, managing and editing content)	Both	Browsers, office suits, media players, multimedia, sotfware, editors, etc.
Files (Created, run, managed and editable by sotfware)	Both	Books, music, films, podcasts, etc.
1.0 content websites and applications	Both	Of newspaper, institutions, companies, and products; search engines; online reference material (databases, dictionaries...); games, virtual environments; etc.
2.0 content websites and applications	Both	Blogs, Wiki, message boards, listing sites, video, sharing
Social media	Both	Virtual communities, social networks, etc.
Communications services	Both	E-mailing, videoconference, instant messasing, etc.
Online learning enviroments	Teaching-oriented	Virtual Learning Enviroments (VLEs), web quests, online lesson plans, digital text books, educational app, etc.

Prepared by authors based on review results (Navarro-Pablo et al., 2019:85).

According to the review of the resources or digital materials used in CLIL, presented by Navarro-Pablo et al (2019:85), it is considered attractive to know, which digital resources have been most used in CLIL in educational contexts of school high school? Furthermore, what impact has it had on students in their teaching-learning processes of L2? In Spain, Durán & Cruz (2013) integrated children's stories with web 2.0 + CLIL for learning English as a foreign language in students in grades 2 and 6. The students of 2 grade of primary school worked with the story of "the three little pigs" as a subject of knowledge in Natural Sciences articulated with the software "Jclic." On the other hand, 6th-grade students worked with the story of "Charlotte's Web", as a subject of knowledge in Natural Science and Art, articulated with the software "Atenex." The results pointed to an affirmative acceptance of the implemented ICTs. Besides, the agendas were well assimilated and understood; the English communication between the children was very motivated, as was their writing (although with grammatical errors). Social relations and interaction among students were other elements to highlight since the perception in their collaborative learning, respect towards their peers, and commitment to their activities was very high.

Ramírez-Verdugo & Sotomayor (2012), from the European CLIL Resource Center for Web 2.0 Education project, worked with 12 CLIL teachers in Web 2.0 Natural Science content and a sample of 300 elementary students (ages

8 to 10) belonging to bilingual public schools in the community of Madrid. In their previous results, they observed that this program increases motivation by provoking a positive affective response, stimulates meaningful learning, and sets in motion many capacities of the learning child: not only verbal ones but also intellectual reasoning and symbolizing abilities, affective, social and creative. In a similar context in the syllabus and content, Molina & Sampietro (2015) investigated educational activities and use of the digital whiteboard and the Internet with Mexican immigrant students (ages 12 to 15) of 7 and 8 grade (in Science Natural) and 9th grade (in Biology) of Texas High School (USA), with very low or no English levels. The results were auspicious since ICT resources with CLIL immersion favored attention, motivation, student participation, and more significant work of the lexicon. Besides, the digital whiteboard stimulated kinesthetic learning, and the web stimulated experiential and auditory learning in the teaching and learning process in L2. In the Spanish context, Custodio & Caballero-García (2016) developed a research innovation proposal for the classroom using ICT and the CLIL approach in teaching the foreign language in primary education (ages 6 to 12) and secondary mandatory (ages 12 to 16). Their results converged in the confirmation of the improvement of the students' linguistic competence, both in necessary communication skills and in the cognitive domain of academic language. From De Waard & Demeulenaere (2017), they developed an exploratory study with a mixed approach, for one year, with 42 Belgian students from five secondary school with ages from 16 to 17 years. They implemented a Massive Online Open Course (MOOC) with CLIL (MOOC-CLIL), developed in three phases: a) Collaborative (where they looked at the structure and elements of the MOOC as a group); b) Selection (the student takes the MOOC preferably individually); c) Production (The student contributes to his chosen MOOC and socializes it to the course by video). The results showed that most of the students were intrinsically motivated based on the progress of the course. In linguistic skills, their vocabularies were more contextualized and adjusted to the reality of the chosen topic. His collaborative learning and interaction among his peers was an enriching element. Thus, their levels of critical thinking and management towards self-regulated self-learning were favored.

From previous research, it can be perceived that ICT, materials, or digital resources are a useful support tool in the CLIL methodology. Teachers point to the articulation of the use of web and web 2.0, web applications, web tools and technological peripherals, as instructional elements, with high sense of innovation and interaction in the classroom of the L2 (Cinganotto & Cuccurullo 2016; Krajka, Możejko & Gadomska, 2016; Navarro-Pablo et al, 2019). Similarly, it can be seen that the combination of digital resources and CLIL immersion, allow students significant experiences in their learning in L2, encourage motivation and interest in the foreign language, stimulate more collaborative learning and contribute to the development of language skills in an L2 (Bozdoğan, 2015; Maggi, Cherubin & Pascual, 2014; Scott & Beadle, 2014).

2.3. The Research

This research work arises from the problems currently shown by Colombian students in a secondary school in rural and urban-rural areas in vulnerable south-western Colombia. Students in these areas show a low attitude, low academic performance and a tendency to demotivate the apprehension and acquisition of English as a foreign language in their traditional class (EFL) in recent decades (Abaunza, Rodríguez-Conde, Sánchez & Martínez-Abad, 2017; Bastidas & Muñoz, 2011). These statements are confirmed by other evidence included in previous studies, which reflect the opinion of teachers specialized in foreign languages, and census and sample evaluations of government agencies and specialized private agencies of the Colombian country (Education First English Proficiency Index, 2018; Colombian Institute for the Evaluation of Education - ICFES, 2018; Jabba, 2013). Regarding these complexities and the conceptual framework and state of the issue addressed, this research seeks

to implement CLIL methodologies through the b-learning approach and the integration of the Duolingo web application in contexts with great socio-economic diversity.

The Duolingo web application, which is available in mobile and desktop versions, works with any operating system (www.duolingo.com), has been evaluated with scientific rigor in similar contexts, obtaining favorable results in its implementation (Ahmed, 2016; Munday, 2016; Vesselinov & Grego, 2012). The Blended Learning (BL) approach was selected because this mixed teaching-learning system facilitates interaction and collaborative learning among students, favoring the educational process (Lim & Wang, 2016). Finally, the CLIL methodology is integrated as an alternative of a possible solution to the main problem of school contexts with more disadvantaged socio-economic levels, and to be able to verify whether these digital resources and immersion methodologies can contribute to the strengthening and motivation towards the teaching process -learning of the foreign language in the traditional class (EFL). According to this premise, and the cases raised by the literature review, there is a lack of knowledge in associated studies in this educational context in urban and vulnerable rural populations, showing a clear justification for conducting this research.

3. Methodology

3.1. Research objectives

The general objective of this research is to assess the effectiveness of EFL training in educational contexts of diverse socioeconomic levels using the integrated Duolingo web application in BL environments and using CLIL methodologies. Based on this general objective, three specific objectives are proposed:

- Check whether the effectiveness of EFL training through Duolingo + CLIL is different depending on the socio-economic, educational context.
- Check whether different levels of initial motivation towards teaching EFL involve different levels of learning with the methodologies implemented.
- Check the influence of sociodemographic variables on EFL learning through the methodologies implemented.

3.2. Design

The research contemplates a quasi-experimental design with three groups in the pretest and posttest phase (Campbell & Stanley, 1995). In this sense, the application of the treatment, standardized performance tests is applied to check the evolution of the level of mastery reached by the students of diverse socio-economic contexts.

3.3. Variables

Dependent Variables: Standardized English Test (Cambridge Assessment English); Students' motivational degree towards English class.

Independent variables: Type of integration of technological treatment in teaching English (activities with Duolingo web application and blended-Learning environments); Socioeconomic level; Type of school: Urban, Rural-Urban, Rural-Vulnerable.

3.4. Population and sample

Research students (n = 94) belong to the sixth grade of secondary school with ages between 9 and 15 years. Specifically, they belong to three schools located in different socio-geographical areas: Urban (U) (n = 32), Rural-Urban (RU) (n = 32), and Vulnerable Rural (VR) (n = 30), located in the south-west of Colombia. Regarding the teaching staff associated with the study, five teachers were articulated (3 in the area of English and 2 in computer science):

The teacher belonging to the U school mentions that he has experience as a university teacher in EFL, has a master's degree in his field, is considered optimal in his digital skills, and articulates his classes in 60% to 80% in English. The RU teacher, who has a bachelor's degree in foreign languages, considers that he has acceptable digital skills, and in his classes, he only articulates English when he deems it convenient. The VR teacher has professional studies in Spanish and English, considers that his digital skills are acceptable, and articulates English with CLIL methodology in 20% of his EFL classes. Computer science teachers were mediators and provided their classrooms for the implementation of technological treatment. Regarding the computer equipment, the U school offers 1 PC for each student; RU school offers 1 to 2 students per PC and, in VR School, 2 to 3 PCs per student.

3.5. Variables

Yields in English. An online standardized test, Cambridge Assessment English (https://www.cambridgeenglish.org/es/test-your-english/for-schools/). This test consists of 25 questions and assigns the student according to his score (0 to 25). These scores are based on the Common European Framework of Reference for Languages (CEFR). The test places the student's low scores in Cambridge English: Young Learners: Pre A1 Starters (YLE Starters) and the high scores in the Cambridge English: Proficiency (CPE); C1 Business Higher (BEC Higher).

EFL student motivation. For obtaining the data associated with motivation, the motivational evaluation questionnaire of the learning process (EMPA) developed by Quevedo-Blasco, Quevedo-Blasco, & Téllez-Trani (2016) was used. This instrument is made up of 33 items and two dimensions, where the Extrinsic Motivation (EM) dimension comprises ten items and the remaining 23 items establish the Intrinsic Motivation (IM) dimension. The instrument choice proof converges in its application antecedent, which was carried out with high school students with ages from 10 to 17 years, and these parameters are adjusted to the population of this study.

Socioeconomic level. In order to obtain this information, questions associated with the dictionary tool of know pro (generic) variables 2016-2017 period, socioeconomic information section of the document diccionario de variables saber 3° 5° 9° period 2017 (https://www.icfes.gov.co/documents/20143/518232/ Diccionario% 20saber% 20359%202017%20estudiante.pdf) included on pages 4 and 7 were used.

3.6. Field work

Previous Enrollments. Before beginning the experiment, the authorization of the rectors, teachers, and students of each school was counted. A pilot test was carried out, consisting of a sample and training day to verify the viability of digital resources in the work environment (internet connection, computer capacity, operation of the web application). Regarding the use of the Duolingo web application: the students and the U School teacher mentioned that they knew the Duolingo web application and had already worked previously, but very superficially in some activities for their EFL classes in previous courses. The teacher mentioned that he had not considered the idea of how to articulate the activity tree in the class curriculum. On the other hand, the teacher

and students of the RU school expressed that they had heard of Duolingo, but it had never been used. In VR school, his teacher states that he knew the application and had applied in some exercises of his class in previous courses, but that his limitations were the infrequency of the internet, few devices (mobile and PC) by children (for its economic resources), and low availability of the computer room. Regarding the students of this course, they mentioned that they were unaware of the application.

According to these considerations, and following the methodology suggested by Cambell & Stanley (1995), it was tried to control the study variables to avoid biases rigorously. That is why the three schools were trained in the handling of the Duolingo for Schools dashboard (https://schools.duolingo.com). Besides, teachers and students worked on the content of the curriculum mesh content belonging to sixth grade in the subject, suggested by the bilingual Colombian curriculum scheme by the Colombian Ministry of Education (MEN, 2016) in English and related lessons with the web application activity tree. It is essential to clarify that the activities in Duolingo are the same in mobile and desktop versions. Figure 1 shows the proposed integration of activities for this study, which was consulted and endorsed by three professionals in the curricular area and considered in the pilot implementation test.

Figure 1
Proposal for the integration of activities
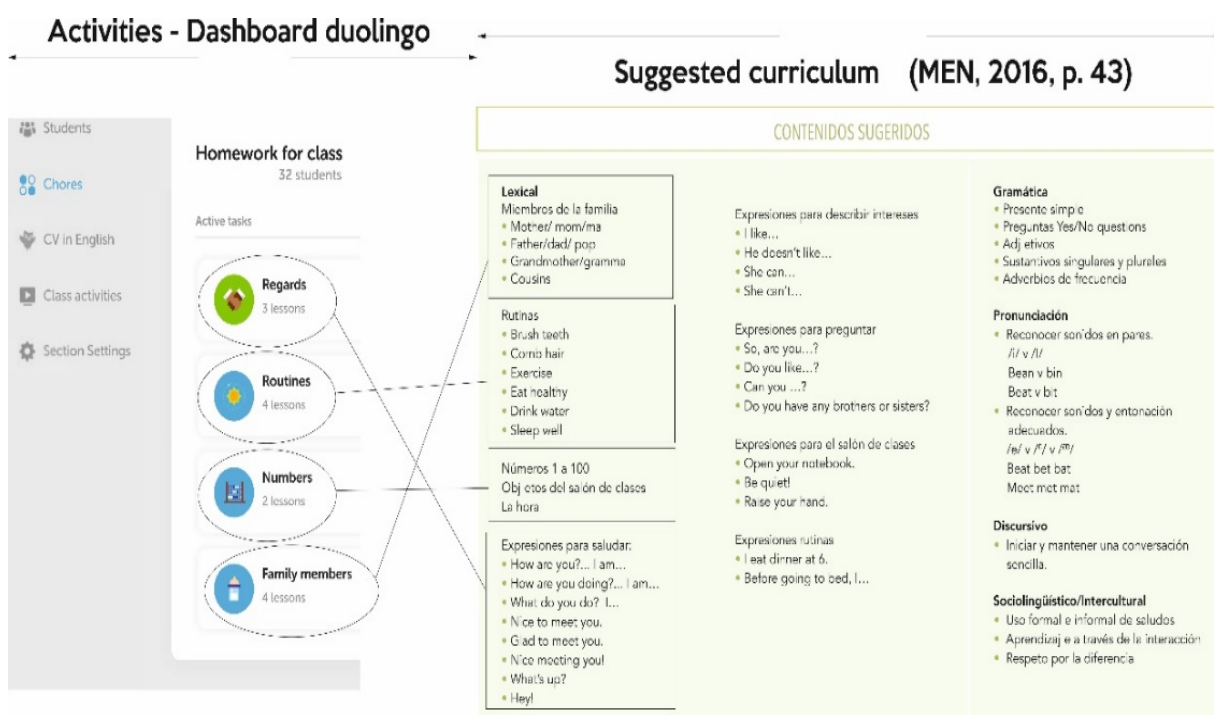
Prepared by authors based on review results (MEN, 2016 and dashboard Duolingo for schools)

In the case of the three schools, the implementation of the web application was suggested for one hour per week in their classes, and it was requested that the activities should be developed from October and completed before December 1 of the 2016-2017 academic year. Following these considerations, the teacher and student of the U school, to avoid complexities in their schedule of activities, decided to develop their Duolingo activities with students' devices (mobile and PC) for one hour at home. RU School applied Duolingo as an additional hour with the devices available to students in their homes. Finally, the VR school implemented it during their workshop time within the school and decided to reinforce it with an extra hour in extracurricular hours in the computer room (because most students did not have devices such as PC or mobile and internet).

Regarding the English teaching-learning process (EFL) in educational institutions, MEN (2016:43) suggests 3 to 4 hours per week for an annual accumulated of 90 to 100 hours. U and RU schools address the teaching methodology of English class (EFL) without CLIL, and VR School applies CLIL + EFL. The three schools committed to developing Duolingo activities at the recommended time. For collecting the information, the dashboard of the Duolingo application was used with predetermined accounts for each student (prepared by the researchers to guarantee the same starting point), allowing precise mapping of the progress of the activities. The students of the three colleges underwent the EMPA instrument and evaluation of previous knowledge to determine their level of English through a standardized online test, offered by the Cambridge Assessment English, for 15 to 25 minutes.

3.7. Data Analysis

The SPSS Statistics 20 software supported descriptive and inferential analysis. Given the lack of normality of the dependent variable (performance in English using the Cambridge test) and the small sample size, it was decided to apply non-parametric contrasts in the application of the hypothesis contrasts (Wilcoxon W for two related samples, and Kruskal-Wallis H for k independent groups). On the other hand, the statistic used to analyze the relationships between quantitative variables is Pearson's correlation. Together with the contrasts of significant hypotheses in the cases of 2 related groups, the statistic of the effect size is calculated using Cohen's d.

4. Results and discussion

4.1. Initial sample scan

Below are the first results of the descriptive analysis at the previous time of application of the quasi-experimental design (Table 2). Regarding the U group, its students are within the aged standard suggested by the Colombian Ministry of Education, and their academic performance tends to be higher compared to the RU and VR groups. The RU and VR groups tend to go beyond the aged standard, more noticeable in VR; the same trend is reflected in their academic performance.
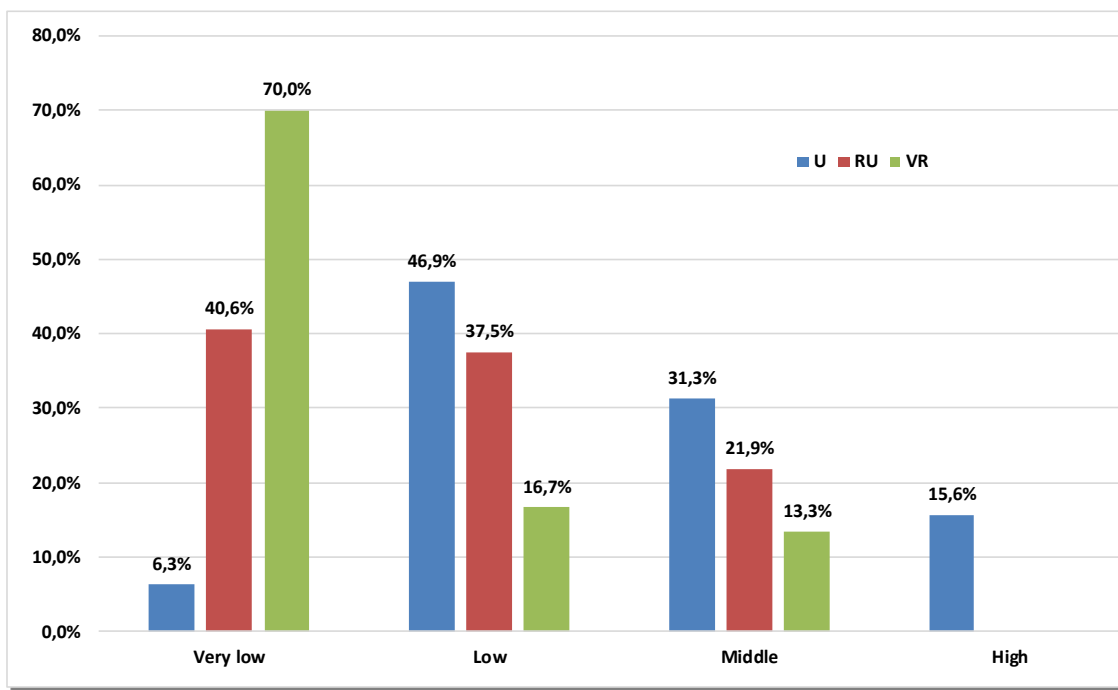
Table 2
Distribution of the sample, concerning gender, age, and academic
performance in English, by each educational center

Secondary schools	Gender		Age (years old)							English achievements	
	Men	Women	9	10	11	12	13	14	15	Mean	Sd
U (N=32)	65.63%	34.38%	6.25%	37.50%	56.25%	0.00%	0.00%	0.00%	0.00%	3.89	0.44
RU (N=32)	31.25%	68.75%	3.13%	18.75%	50.00%	21.88%	6.25%	0.00%	0.00%	3.37	0.84
VR (N=30)	46.67%	53.33%	6.67%	26.67%	10.00%	23.33%	10.00%	16.67%	6.67%	3.03	0.78

Source: Authors

Figure 2 shows the distribution of the sample by socio-economic level, dividing the subjects by school. It is observed how the most normal socio-economic level in VR and RU schools is deficient, this trend being more pronounced in the case of VR. On the other hand, the students of the U school present socio-economic levels mainly between middle and low.

Figure 2
Distribution of the socio-economic level according to the school

Source:Authors

Regarding the motivation of the students according to the socioeconomic context, table 3 shows higher levels of both extrinsic and intrinsic motivation in the sample of the U school. In this sense, considering the school variable as a variable of ordinal nature (U = 1; RU = 2; VR = 3), high-intensity inverse spearman correlation coefficients are obtained with intrinsic motivation (rs = -. 641; p. <. 001), extrinsic (rs = -. 775; p. <. 001) and global (rs = -. 758; p. <. 001). This fact implies that there is a clear association between both variables, with higher motivations being observed in schools with higher socioeconomic levels.

Table 3
Descriptions for motivation in students

Motivation	U (n=32)			RU (n=32)			VR (n=30)		
	Mean	Md	Sd	Mean	Md	Sd	Mean	Md	Sd
Intrinsic	4.39	4.40	0.30	3.74	3.85	0.35	3.44	3.70	0.79
Extrinsic	4.32	4.30	0.11	3.36	3.52	0.41	3.08	3.41	0.69
Global	4.34	4.35	0.10	3.47	3.61	0.36	3.18	3.53	0.71

Source: Authors

4.2.   Quasi-experiment descriptive analysis

The results of the pretest and posttest measures in the three groups are positive (table 4) and point towards a possible confirmation of the research hypothesis, showing that the integration of Duolingo can favor the learning performance of English as a foreign language both in urban populations, as in vulnerable populations, as can be seen in the VR group. Similar results are expressed in similar contexts (Abaunza, Martínez-Abad & Rodríguez-Conde, 2019; Ahmed, 2016; Munday, 2016).

Table 4
Descriptive for pretest and posttest performance in the Cambridge standardized test

Secondary schools	Phase	Mean	Sd	-A	A1	A2	B1	B1+
U	Pretest	12.15	2.17	3.1%	46.9%	40.6%	9.4%	0.0%
	Posttest	13.90	2.66	0%	18.8%	46.9%	21.9%	12.5%
RU	Pretest	5.15	3.57	87.5%	12.5%	0.0%	0.0%	0.0%
	Posttest	7.18	3.70	50.0%	40.6%	9.4%	0.0%	0.0%
VR	Pretest	2.40	1.32	100%	0.0%	0.0%	0.0%	0.0%
	Posttest	7.60	2.49	53.3%	46.7%	0.0%	0.0%	0.0%

Las The English level scale (-A, A1, A2, B1, B1 +, B2, C1 and C2) established by the Common European Framework of Reference for Languages (CEFR). In which A1 refers to a basic level of English, up to C2 which implies mastering English, established by Council of Europe.

Source: Authors

At a general level, the level of English proficiency achieved by students has improved (figure 3). While in the pretest more than 60% of the students did not reach an A1 level, in the posttest there are more than 30% of the students who reach the A2 level or higher

Figure 3
Evolution of the level of English proficiency of students
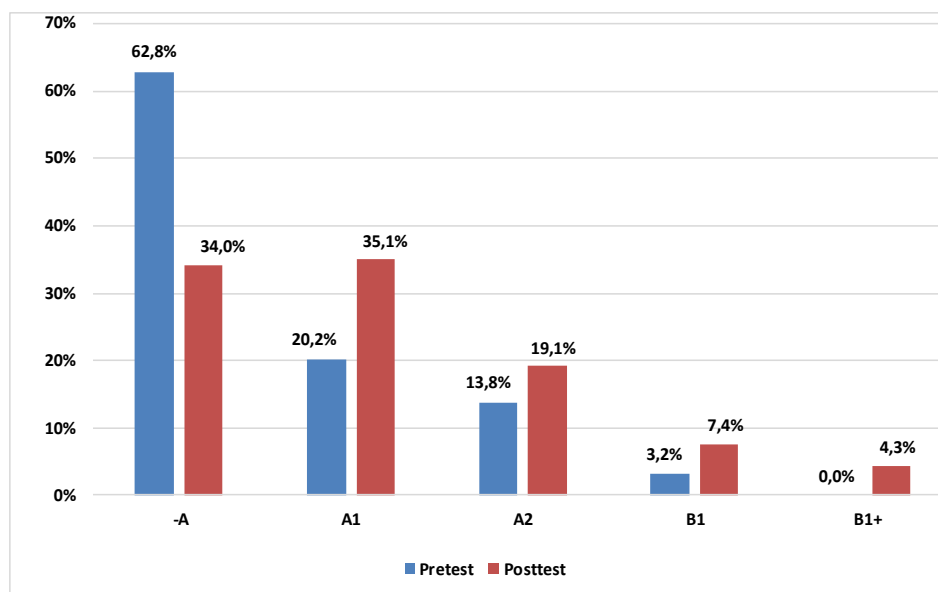
Source: Authors

4.3. Hypothesis Contrasts

First, scores obtained are compared in the pretest and posttest, the same way as in the difference, depending on the school (socio-economic context). In this sense, table 5 shows how the scores obtained by the groups according to the school are significantly different both in the pretest and in the posttest, obtaining differences between the urban context group and the other two groups in both cases. As for the posttest-pretest differences caused by the application of the educational program, there are significant differences between students in the vulnerable rural context and the other two groups.

Table 5
Differences in Pretest, Posttest, and Difference depending
on the socio-economic level (school).

	F	p.	Post-hoc
Pretest	63.722	<.001	VR-RU (non-significant, p=.344)
			VR-U (significant, p<.001)
			RU-U (significant, p<.001)
Posttest	53.147	<.001	RU-VR (non-significant, p=.904)
			RU-U (significant, p<.001)
			VR-U (significant, p.<.001)
Posttest-Pretest Difference	39.069	<.001	U-RU (non-significant, p=.693)
			U-VR (significant, p<.001)
			RU-VR (significant, p<.001)

Source: Authors

These differences can be easily interpreted from Figure 4, which shows the scores in the pretest and posttest in each of the groups. While the students of the U school, with a more favorable socio-economic environment, score significantly higher than the rest in both the pretest and the posttest, the evolution of knowledge (pending the straight or posttest-pretest difference) is significantly higher in the group of VR school students, with a less favorable socio-economic environment. It is observed how, while in the pretest they reached scores clearly below the rest, these students reach in absolute terms the level of mastery of the students of the U school.

Figure 4
Efficacy of treatment in socio-economic study groups
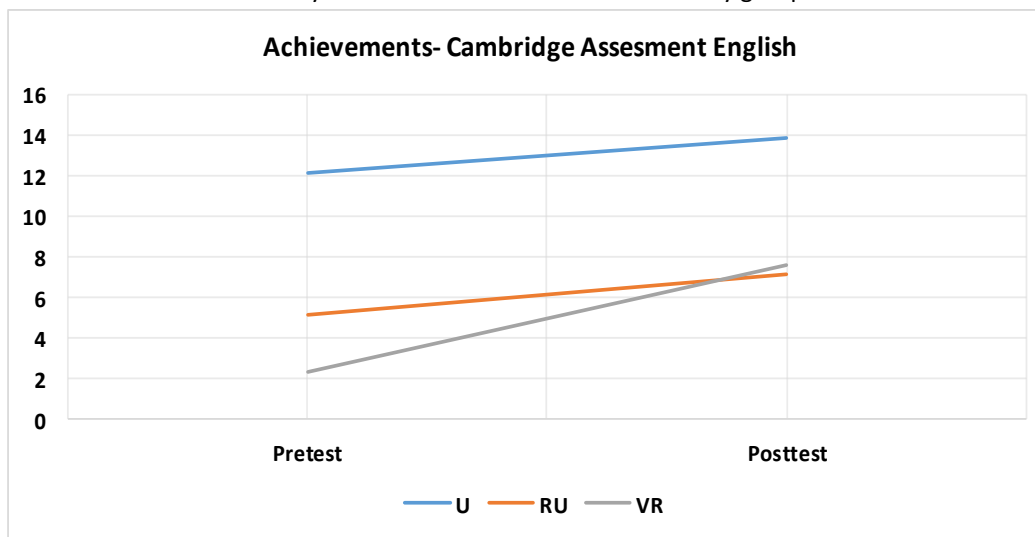
Source: Authors

Regarding the level of significance of the posttest-pretest differences in each of the study groups, it is observed that the evolution in all cases has been significant, that is, the EFL training using the Duolingo web application with methodologies BL and CLIL has been effective in all socio-economic contexts. However, taking into account the effect size, while moderate effects of the treatment are observed in the U and RU contexts, the treatment effect has been substantial in the VR context.

Table 6
Contrast hypothesis related groups. Posttest-pretest differences by context

Secondary schools	Z	p.	d
U	-4.08	<.001	0.72
RU	-4.67	<.001	0.56
VR	-4.80	<.001	2.60

Source: Authors

Finally, the correlation between some variables of interest of the study and the standardized performance reached in the pretest in the posttest and the posttest-pretest difference is analyzed (table 7). While gender is not significantly related to performance, the socio-economic level does have significant relationships: Although higher socio-economic levels are moderately associated with higher yields both pretest and posttest, the Students who benefit most from EFL training are those with lower socioeconomic levels. In the case of the motivation analysis, the same thing happens as in the socio-economic level, while the most motivated students are those who reach higher yields in both pretest and posttest, it is the students who were less motivated at the beginning who they have managed to evolve in a more pronounced way thanks to this educational program. This effect is pronounced in the case of extrinsic motivation.

Table 7
Cambridge standardized performance correlation with study variables - proxy (p.)

	Pretest	Posttest	Difference Pretest-Posttest
Gender	-.094 (.366)	-.083 (.426)	.042 (.688)
Socio-economic levels	.436 (<.001)	.344 (<.001)	-.269 (.009)
Intrinsic Motivation	.507 (<.001)	.389 (<.001)	-.330 (.001)
Extrinsic Motivation	.644 (<.001)	.511 (<.001)	-.389 (<.001)
Global Motivation	.622 (<.001)	.490 (<.001)	-.383 (<.001)

Source: Authors

Therefore, based on the evidence collected, it can be affirmed, on the one hand, that the educational program applied has been active for teaching EFL, regardless of the socio-economic context of the students. On the other hand, it can be affirmed that this type of training actions, which combine the use of the Duolingo website with BL and CLIL methodologies, is more effective in vulnerable social contexts. Likewise, it seems that these methodologies favor the involvement and more excellent orientation towards the learning of the students that start from low motivational and socio-economic levels

5. Conclusions

According to the results shown in this research, it can be seen that it was a useful study because the pretest and posttest provided encouraging responses with significant statistical figures. It could be shown that the EFL training effectiveness in educational contexts of diverse socio-economic levels using the Duolingo web application in conjunction with BL + CLIL was positive. Regarding the first objective, check whether the effectiveness of EFL training through Duolingo + CLIL is different depending on the socio-economic, educational context. It was evident that College U, which has a better economic situation, showed in its pretest and posttest phase a superiority over the other two groups (VR and RU), but according to the trend of knowledge evolution with BL + CLIL, the VR group being subject to these methodologies theoretically will reach the U group. Trends

more linked to CLIL methodologies, where time and experience are essential variables, similar situations seen in other studies (Agustín-Llach & Canga, 2016; Martínez, 2019; Navarro-Pablo et al, 2019).

According to the second research objective, check if different levels of initial motivation towards teaching EFL involve different levels of learning with the methodologies implemented. The results explain that the most motivated students are the ones who achieve higher yields both in the pretest and posttest phases. Regarding the students who reflected a low initial motivation, thanks to the integration of CLIL + BL, they were able to evolve more progressively thanks to these methodologies, this effect is more pronounced in the case of extrinsic motivation, a similar case in European studies (Durán & Cruz, 2013; Lasagabaster; 2011; Ramírez-Verdugo & Sotomayor, 2012). Following the order of ideas, the third research objective, verify the influence of sociodemographic variables on EFL learning through the methodologies implemented. It can be said that this type of training methodologies with the Duolingo web application with BL + CLIL can be more effective in sociodemographic contexts of a vulnerable nature.

In conclusion, it is considered necessary to increase experimental studies in combination with qualitative research on the application of technological methodologies in combination with CLIL in strengthening learning processes and their influence on the L2 class in these educational contexts. To deepen and triangulate with mixed approaches, new perspectives and seek a generalization of the results in other areas of the country.

Acknowledgments

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